TEXTILES PAPER LEATHER

AMERICAN DYESTUFF REPORTER

Including the Proceedings of the
AMERICAN ASSOCIATION OF TEXTILE CHEMISTS AND COLORISTS

VOLUME XII NOVEMBER 19, 1923 NUMBER 24

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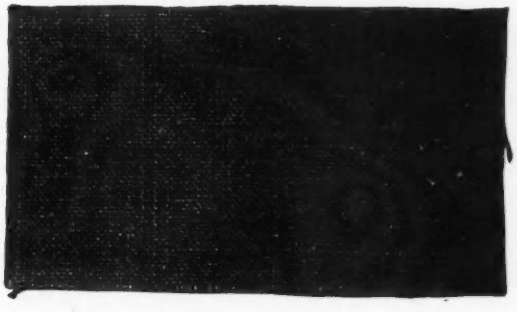

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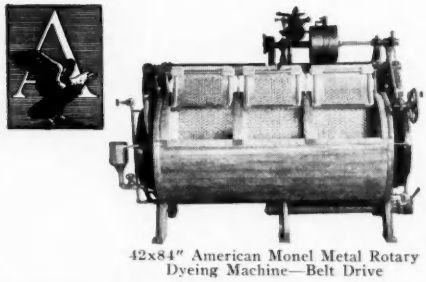

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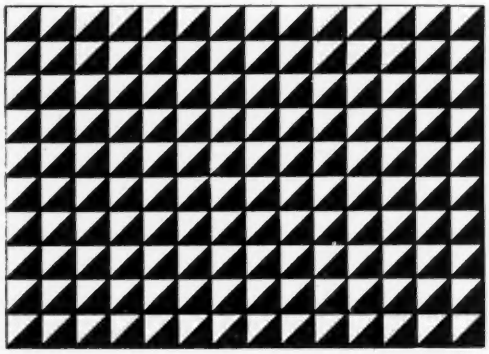

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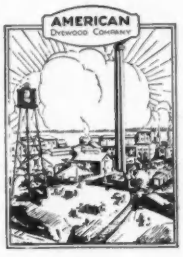

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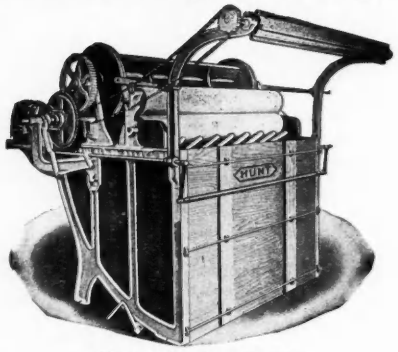

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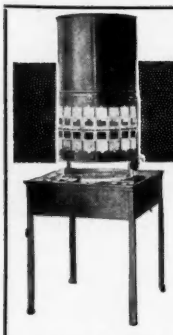

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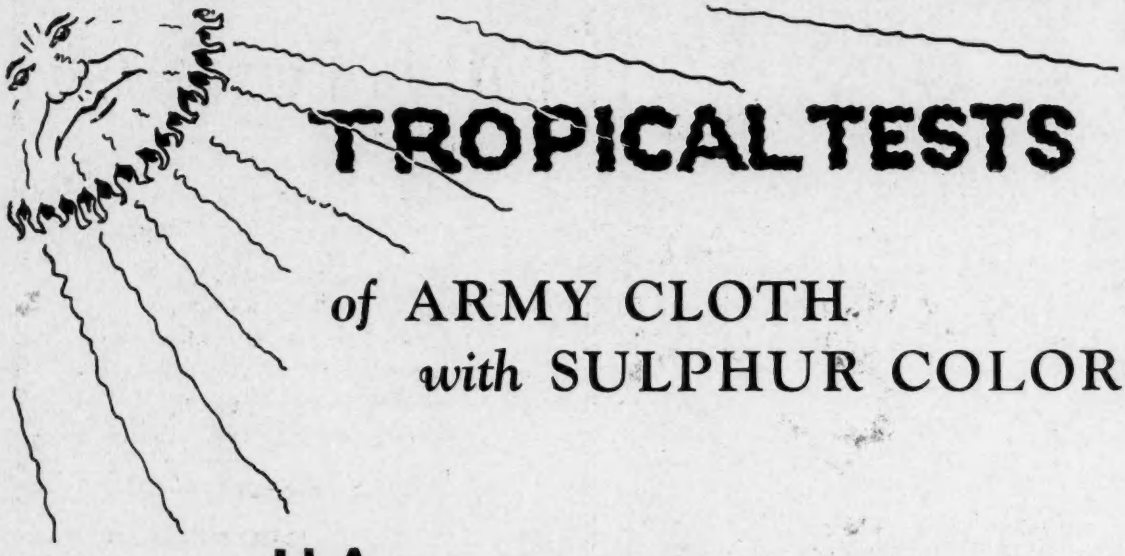

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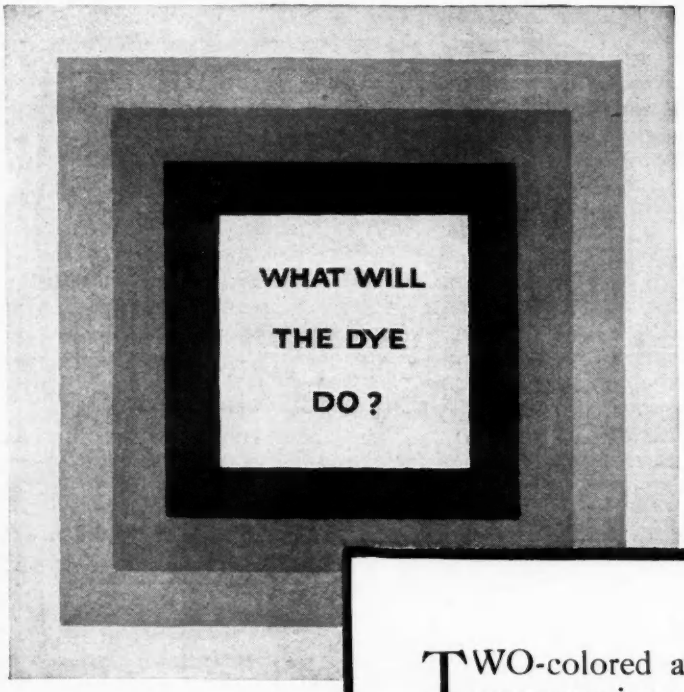

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VOLUME XII | NEW YORK, NOVEMBER 19, 1923 | NUMBER 24

Efficiency in Padding Cotton Piece Goods

Padding Machinery—Savings Through Efficiency—Softening Water—Reducing the Number of Seconds—Saving of Dyestuff—Importance of Dye Formulae—Importance of a Dye Mixer for All Machines

By M. W. ALLING

Waldrich Bleachery, Delawanna, N. J.

[Editor's Note: The padding machines mentioned in this article are of no standard type, but were assembled for the particular use of the Waldrich Bleachery. In an article by Mr. Alling published in the November 20, 1922, issue of The REPORTER these machines are clearly described in detail.]

THE power of the knowledge of the simplest fundamental principles of padding cotton piece goods (those that deal with material, labor and machinery) is in the result of eliminating waste and establishing efficiency. If these principles are thoroughly understood and religiously adhered to, the dyer will know where the money goes, when the standards of production are not realized, where the losses are occurring, etc.

The writer's experience in the correction of these elements of production has brought to light some astonishing facts with regard to the degree of efficiency with which this work may be conducted.

PADDING MACHINERY

Instead of considering one padding machine, this article will treat with two types of machines and three of each type. This is quite necessary, because it gives a clearer idea of the results obtained, and it also represents a sufficient group to carry on a large production and to do a great variety of work.

The first type is a so-called fast semi-slop pad; that is, it dyes the cloth at the rate of 216 yards per minute; the cloth dips slightly underneath the dye solution, but it is dependent upon what is carried up to the nip by the bottom roll to do the actual dyeing. The other type is called a dip pad. The mangle rolls are principally used for squeezing out the dye solution evenly from the cloth, and the dyeing takes place while the cloth is passing underneath the dye solution in the padding trough below. In back of this pad there is placed a set of dyeing cans, so that the cloth can be dyed and dried in one operation. This is different from the fast pads, as on these the cloth is batched up and afterward dried from the roll. The speed of the dip pad depends upon the weight of the goods and the number of drying cans that are attached to it. If the cloth is very heavy the speed of the machine should be about 60 yards per minute; but if the cloth is light in weight this speed may be increased until the moisture ceases to be driven off at the third can from the end.

SAVINGS THROUGH EFFICIENCY

One of the corrections made to the fast semi-slop pad was in the dye liquor feed pipe. For years the dye solution had been fed into one end of the dye trough. This current of dye solution is hotter and more concentrated, coming direct from the large mixing tanks, than the solution in the dye trough, which becomes cooled by the churning of the mangle rolls and also partly exhausted by the cloth passing through it, which absorbs more of the dye in proportion than it does the water. Wherever this current comes in contact with the cloth there is a resultant dark streak, first in one place and then in another, according to the path which the dye solution takes. Naturally there is more unevenness on the wider class of goods, because this current has less chance to be uniformly mixed before striking the cloth.

This trouble of streaks had been attributed to an uneven set or pressure of the two mangle rolls and to the wearing out of these rolls. In some cases the adjusting of the set had overcome the trouble, because this current of dye solution kept to a uniform path on one side.

In the correction of this it was only necessary to attach a perforated feed pipe which sprayed the solution evenly across. These fine streams were very quickly and uniformly mixed with the dye solution in the trough, and there was no further trouble from this source.

The saving was not so great, but it represented a link in the chain of unnecessary expense and trouble. The cost of taking down a machine, of buffing off the rolls and putting it up again, amounts to about $24. The real trouble not having been recognized, this was done more often than was necessary; so that after the correction had been made the repair work was cut in half, which made a saving of approximately $200 per year. In addition to this, there was a saving in rehandled goods, which formerly had to be rebleached and redyed. This amounted to at least $51 per year, besides obtaining a correspondingly larger amount of production.

On the fast semi-slop pads it is necessary to have tin guards covering a part of the end of each roll, to stop the dye liquor as it is thrown off by the rapidly revolving rolls from splashing on the cloth while it batches up. These guards were wider than necessary, and so the cloth measuring more than 39 inches in width could not be run in between them. These were narrowed up to 1½ inches from the ends of the rolls, which left room for goods 43 inches wide. There is a yearly demand for about 900,000 yards of this class of work. It had been previously dyed on the dip pads at a speed of 60 yards per minute, but after this correction they were dyed on the fast semi-slop pad in less than one-half of the time that it formerly took, which represented a saving in labor of about $220 per year.

There was still another mechanical change which had to be made. This was to overcome particles of dye suspended in the dye solution from entering into the dye trough. The dyestuff is dissolved, strained, and then boiled in the mixing tanks, but there is always danger from dye spots in spite of these precautions. It had been the case of trust to luck whether the goods came out spotted or not, and there proved to be an average loss per day of about 5,000 yards of perfectly dyed work. This trouble was overcome by putting a straining bag on the feed pipe, which strained the dye as fast as it was being used. These bags were made up of different kinds of material—in fact, a haphazard selection had been made of anything available—but the blow-outs in some of this material were disastrous, and a careful selection of cloth as to strength and count had to be made. A piece of low-grade plain goods in the gray state proved to be the best, and would filter 3,400 gallons before it developed a possible blow-out. A copper wire mesh was tried by encircling the feed pipe with it, but the interstices clogged up immediately.

The saving that this change made was from cutting down the rebleaching and redyeing, and it amounted to about $304 per year.

Softening Water

The water in use was more or less charged with salts of lime and magnesium, according to the weather. During a rainy spell its degree of hardness was greatly reduced by the surface water.

Phosphate of soda was used to soften this water; but the exact amount had never been determined. This correction was carefully worked out and the result was a $1,000 yearly saving.

Saving of Cloth

Strange as it may seem, few mill hands realize the value of cotton cloth. If it is in the 16-cents-per-yard class or better there is no conceivable amount of labor or material that can be used upon it, in finishing of any kind, that equals its own value; so that above everything else it must be everlastingly looked after and kept out of the waste can and the remnant room, otherwise the loss from one department to another will be appalling and the money which this represents will mount up to an enormous sum.

On the padding machines a regular practice had been made of tearing off a long strip along the selvedge of the cloth to be dyed, which was used to run a trial patch through the dye solution in order to see if the correct dyestuffs had been added to the feeding tanks to give the required shade. This was changed by tearing off a patch 6 inches long and sew it onto a long strip of waste cloth. This change saved 1½ yards for every shade dyed, and amounted to approximately 3,900 yards per year; and, as the average value was 16 cents per yard, the saving amounted to $624 per year.

The first operation in dyeing on the padding machine is in threading it up. It had been the general practice to use the goods to be dyed for this purpose. Obviously this was very wasteful. The remedy was to sew on an end of waste cloth each time. This in itself is very simple, but to train the machine operators and to make them realize the importance of saving cloth proved to be the real problem but one which was well worth while, as these figures will show.

To thread up the three fast pads it takes 10½ yards of cloth, and for the three dip pads it takes 6 yards of cloth. These pads have to be threaded up for each new shade, which averages about twenty-two in a day. This represents 181½ yards; and as there are 260 working days in a year, the total would be 47,190 yards and, with a value placed at 16 cents per yard, the sum saved by using the end cloths would amount to $7,100.40.

Before a shade can be run complete it is necessary to run a 30-yard piece, and then stop to take out a patch, which has to be compared with the sample to

be matched to. These stops on the fast pads per day amount to twenty-four and the waste is 60 yards; in one year this would amount to 15,600 yards, with a value of $2,496. The stops on the dip pads number thirty, and they waste 25 yards per day and 6,500 yards per year, valued at $1,040. The fast pads stop for every roll that is dyed, and there are forty-five of these, which waste 157½ yards per day or 40,950 yards per year, valued at $6,552.

These wasteful stops have not as yet been eliminated; but a cutter is in the course of construction which will cut the cloth off at will so that the end will pass through and not become stained by resting in the dye liquor.

Reducing the Number of Seconds

One way of making seconds is by dyeing pieces which are off-shade from the regular run. This is unavoidable, because when the trial patch shows a perfect match to the sample there is nothing certain about the run being exactly like the patch; therefore a piece must be run. It had been customary to run to a seam, sometimes 60 yards and sometimes 120 yards. The correction in this case was to run only 30 yards, or a piece long enough so that it would not be classed as a remnant.

Providing six pads ran twenty-four shades per day and thirty off-shade pieces, under the old system there would have been 2,700 yards of seconds, whereas under the present method there are only 900 yards. This makes a saving of 1,800 yards, and in one year this would amount to 468,000 yards. There is a loss of one-half of the finishing charges for each yard of seconds, so that if this were 2½ cents per yard the loss would amount to $5,265 per year.

Saving of Dyestuff

It had been the custom to run all trial patches through the liquor trough underneath the pad mangle rolls. This trough was partly filled with the dye solution and the proper amount of water was added. The patch was then passed through. If this didn't give the correct shade the liquor was thrown away, wasted, and the necessary change was made to the dye solution in the mixing tanks and another patch was run and so on until the shade was obtained. Striking off in this manner took at least ten minutes each time. This was a costly method, as for each patch run which did not give the required result there was a loss of 30 gallons on the fast pads, and 15 gallons on the dip pads, of the dye solution, which has an average value of $2 for every 300 gallons. Providing that there were thirty-six of these strike-offs on the fast pads and the same number on the dip pads per day, there would be a total waste of 1,620 gallons, with a value of $10.80, and in one year this would total $2,808.

The saving in time proved to be five minutes for each patch run, and as there were approximately seventy-two of these per day this time amounted to six hours, and with two men running a machine the labor charge was 78 cents per hour, or $4.68 per day, or $1,216.80 per year.

The saving of the above amounts was made by using in the place of the large dye liquor trough a small patch box which only took 1 gallon of the dye solution and 1 quart of water to run the patch through.

It had not been the general practice to always use common salt in making up the dye solutions. There had been no careful study of its use made to find out just how much darker it would make a shade or how much closer it would bring dyes of different solubility together, or what percentage of the salt, based upon the amount of dyestuff, should be used in a given volume of water, or what amount in dollars and cents the saving of dyestuffs represented where the proper addition of salt was made. This study brought to light the following facts:

Water and cotton cloth have something in common with direct dyestuffs—they each have a natural affinity for it. If a piece of white cloth is dipped in a solution of it there at once begins an unequal struggle between them. The water holds it firmly in solution, while the cloth just a little more firmly proceeds to absorb it, thereby robbing the water of its dye until it has lost all semblance of its pretty hue and in its stead the piece of cloth has become dyed.

There are two ways in which the action of the dye being absorbed by the fiber may be quickened. One of these is to change the nature of the cloth to be dyed by a process of mercerization, and the other is by adding to the dye bath a substance which is more soluble than the dye itself, thereby crowding it out or lessening the grip which the water has upon it so that the fiber can the more easily attract it.

This latter method is of vast importance, because if properly understood the dyer can get much more out of his dyestuff than he otherwise would by neglecting its use. This seems quite improbable, but if we consider for a moment two padding machines exactly alike in every detail, two batches of goods of the same construction and in exactly the same state of bleach, two tanks of dye solution both having the same volume and the same amount of dyestuffs dissolved in them, except in one of these there is an addition of common salt. The machines are started at the same time, the overflow is kept exactly the same, the goods use up all of the dyestuff solution in exactly the same length of time. In other words, everything being equal except for the addition of salt to one of the tanks. If the dyed goods are now examined it will be found that the cloth which ran through the dye solution with the salt added to it is brighter and deeper in shade than the other. But how can this be? we ask ourselves; they both ran through a solution which contained the same amount

of dyestuff, and so they both must be of the same depth of shade. But in reality this is not so; there is a difference at least in the appearance: a part of the dye which is on the dyed cloth without the salt cannot be seen.

All dyers know that it is practically impossible to dye economically very deep shades on the padding machine. After a certain amount of dyestuff has been added, further additions do not give proportionately deeper dyeings. This is also true of the lighter shades in a lesser noticeable degree. This tends to show that not all of the dyestuff is fully absorbed by the fiber and that a part of it is left as a residue or paste on and around the fiber. If goods in this state are now run through a starch mix, or even hot water, this dye is dissolved and is either washed off or is absorbed by the fiber, in which case a very much deeper shade is produced. One might think that this unabsorbed dye would show in the form of color specks; and so it does if the goods are extremely repellent; but otherwise it is so fine that it gives the dye the effect of being very light in shade. This effect can be illustrated by shaving a piece of ice which has a distinct color and noting how snow-white the shavings appear to be.

This principle of plastering on dyestuff can be used to advantage on the goods which show resist spots from oxycellulose in dyeing on the jigs. They are first passed through an almost saturated solution of dyestuff, which becomes pasted on uniformly over spots and all. It is then taken to the jig and run in a hot salt solution, which redissolves the dye without changing its position; and as the cloth has still retained some of its affinity for the dye, it soaks in and dyes the cloth perfectly. Of course, if the oxycellulose is too deep-seated it acts as a reducing agent and bleaches out the dye; but this is beside the point and is a separate problem in itself.

Better results from using salt in the dye solution are due to the salt giving the dye such a kick that it is forced into the innermost parts of the fiber, making it certain that more of the dye is absorbed. This study has proved a saving of dyestuffs to the amount of $3,030 per year, or 18¾ per cent of the whole.

Importance of Dye Formulae

The amount of production that a dyer is able to get out of his day's pad work is dependent to a large extent upon his having a great variety of dye formulae and patches of the shades which they will produce. Some of the customers order the same shades over and over again, and in such cases much time is saved, because when once the correct formula is obtained it can be repeatedly used. Other customers send special samples with almost every lot, so that it is necessary to look up a new formula each time, unless it happens that the same shade has been previously ordered, and for just such reason it is very necessary to keep a record of each shade that is dyed.

Before the patch box was brought into play it was practically impossible to obtain a correct formula, because every time that a trial patch did not show the right shade 30 gallons of the dye solution were run to waste, so that the original recipe was shy 12½ per cent; also an addition of dyestuff had to be made, and if this was carried on more than two or three times the fractional amounts were so split up that the formula was very hard to figure out accurately. With the advent of the patch box, there was so little of the dye solution run to waste that any reasonable number of additions could be made and still leave the original formula intact, and all that was necessary to be done to get the sum-total of the ingredients was to tack on the additions.

The loose-leaf book makes it possible to have a very complete record of dye formulae. The customers are arranged in alphabetical order. Patches of the different shades are pasted on different pages, along with their formulae. As fast as these pages are filled up new ones are inserted. A separate section is made for miscellaneous shades which are not classified under any customer and are referred to when there is no previous dyeing of the shade in hand to go by. Another section is set aside for keeping notes pertaining to the work. A system of this kind makes it possible to develop this phase of the work to its greatest efficiency.

These two improvements have made possible quick matching, increased production, the saving of dyestuffs, the saving of labor and a cutting down of goods to be rehandled for being off-shade. This saving in dyestuffs amounts to approximately $2,020 per year. The saving from rehandling in labor and dyestuffs amounts to approximately $1,027. The 12½ per cent in time saved amounts to $1,523.60.

Importance of Making the Exact Amount of Dye Solution

Before the patch box was put into use it was necessary, in order to allow for the waste, to make up a larger volume of the dye solution than was actually needed to dye the goods. This was troublesome, because the number of striking-off patches was never certain and this made it necessary to check up to see if there was enough left after obtaining the correct shade to complete the run. The small patch box does not waste the dye solution to any appreciable amount, so that just the right number of gallons can be made up. This change saved 12½ per cent of the dyestuff and in a year's time this amounted to $2,020.

Importance of a Dye Mixer for All Machines

Each pad operator formerly mixed up his own dye solutions. While this was being done the machines

were standing idle. This was so wasteful of time and so much production was sacrificed that a man was provided to mix these liquors ahead. Each machine has two or more spare tanks, and while a shade is being run the liquor for the next is gotten ready, so that all of the tanks are refilled as fast as they are used up. Under certain conditions where the runs are short two men and a mixer can do the work on one pad that four men can do on two pads without a mixer. This method saves 15 per cent of the cost of labor, which makes a saving of $1,825 per year.

Summary

If we picture in our mind's eye the value of each of these changes as representing a link in a chain of which is now in perfect repair we will see that its value is $40,322.80 more than it was before being overhauled. This sum can be represented as the equivalent to a net profit of 1 cent per yard on a production of 4,032,280 yards per year.

Upon analyzing these figures it will be noted that the principal saving is made of cloth, which amounts to $17,812.40; next is of dyestuffs and a chemical, $10,878; then of seconds, $5,265; of labor, $4,785.40; of rehandling, $1,382; and, last, of repairs, $200. This analysis also shows the relative importance in which they should be watched and cared for.

It is often the case that too much time is given to production problems, with the result that little or no time has been left for the stopping of big and small leaks. Unless this time is taken by the one in charge, or given to someone to superintend, no department or plant can reach a high degree of efficiency.

Foreign Dyes Imported Through the Port of New York During October

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce, in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS FOR FOREIGN MANUFACTURERS

1—The Six Leading German Companies

A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873. Branches in France and Russia.
B—Badische Anilin-und Soda-Fabrik, Ludwigshafen on the Rhine. Founded 1865. Branches in France and Russia.
By—Farbenfabriken vorm. Friedr. Bayer & Co., Leverkusen on the Rhine. Founded 1862. Branches in France and Russia.
C—Leopold Cassella & Co., Frankfort on the Main. Founded 1870. Branches in France and Russia.
K—Kalle & Co., A. G., Biebrich on the Rhine. Founded 1870. Branches in Russia.
M—Farbwerke vorm. Meister Lucius & Bruning, Hochst on the Main. Founded 1862. Branches in France and Russia.

2—The Seven Smaller German Companies

BK—Leipziger Anilinfabrik Beyer & Kegel, Furstenberg near Leipzig. Founded 1882.
GG—Chemikalienwerk Greishem G.m.b.H., Griesheim on the Main. Founded 1881.
CJ—Carl Jager G.m.b.H., Anilinfarbenfabrik, Dusseldorf. Founded 1823.
GrE—Chemische Fabrik Griesheim-Electron, Offenbach on the Main. Founded 1842.
L—Farbwerk Muhlheim vorm. A. Leonhardt & Co., Muhlheim on the Main. Founded 1879. Branch in France.
tM—Chemische Fabriken vorm. Weiler ter Meer, Uerdingen on the Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—Dutch, Belgian and French Companies

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888.
NF—Niederlandische Farbe-und Chemikalienfabrik Delft, Netherlands (Delft). Founded 1897. Branch in Russia.
LG—Lazard Godchaux, of Brussels. (These products are probably compounded largely from the dyes made by A. Wiescher & Co., of Haeren, Belgium.)
P—Societe Anonyme des Matieres colorantes et produits chimiques St. Denis (formerly A. Poirrier), St. Denis, near Paris, France. Founded 1830.

4—Swiss Companies (all at Basel)

DH—Farbwerke vorm. L. Durand, Huguenin & Co. Founded 1871. Branches in Germany and France.
G—Anilinfarben-und Extract-Fabriken vorm. Joh. Rud. Geigy. Founded 1764. Branches in France, Germany and Russia.
I—Geselfschaft fur chemische Industrie. Founded 1885. Branch in France.
S—Chemische Fabrik vorm. Sandoz & Co. Founded 1887.

5—English Companies

BAC—The British Alizarin Co., Ltd. Established 1882.
ClCo—The Clayton Aniline Co., Ltd., Clayton, near Manchester Founded 1876.
CR—Clauss & Co. (formerly Clauss & Ree), Clayton, near Manchester. Founded 1890.
CV—Colne Vale Chemical Co., Milnsbridge, near Huddersfield.
RHS—Read Holliday & Sons, Ltd., Huddersfield. Founded 1820. (Purchases by British Dyes, Ltd.)
BD—British Dyes, Ltd Founded 1915.
Lev—Levinstein, Ltd., Crumpsall Vale, near Manchester. Founded 1864.
Q—Importations of unknown source, through dealers in colors.

THE imports of coal-tar dyes for October totaled 267,556 pounds, with an invoice value of $257,084.

The five dyes leading in quantity imported were Xylene Light Yellow, Indanthrene Green B, Alizarine Rubinol, Alizarine Red and Indanthrene Blue BC. Of the total quantity imported in October, 1923, 31 per cent came from Switzerland, 29 per cent from Germany, 23 per cent from France, 11 per cent from Italy, 4 per cent from England and 2 per cent from other countries.

The following table shows the monthly imports for the year 1923:

Month	Pounds	Value
January*	179,309	$185,344
February	191,709	199,690
March	312,809	301,436
April	242,022	256,751
May	261,869	292,340
June	247,174	257,803
July	144,687	142,428
August	178,164	194,164
September	124,665	128,544

*Not complete.

The imports of synthetic aromatic chemicals for October totaled 3,533 pounds, with an invoice value of $10,372. The imports of medicinals, photographic developers and other coal-tar chemicals for October totaled approximately 29,700 pounds, with an invoice value of $21,749, and the imports of color lakes totaled 1,220 pounds, with an invoice value of $519.

The dyes in this report are grouped by Schultz numbers, and in the case of those which could not be identified by Schultz number the classification according to ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced —in nearly every case—to a single-strength basis.

German Dye Production for August

In conjunction with the October statistics covering the imports of dyes, the following information received from Trade Commissioner F. E. Breithut is rendered relative to the German production of dyes for the month of August according to groups. In addition, the production is rendered according to factories:

Group	Classification	August (pounds)
I.	Alizarine Red	220,334
II.	Indigo paste	982,863
III.	Vat colors except Indan. Blue GCD	201,811
IV.	Indanthrene Blue GCD	.....
V.	Alizarine colors other than red	138,837
VI.	Direct colors for cotton	2,607,148
VII.	Direct colors for diazotization	347,601
VIII.	Acid colors for wool	1,521,105
IX.	Chrome colors for wool	627,431
X.	Basic colors	277,639
XI.	Sulphur colors	2,401,627
XII.	Lake colors	317,170
	Total	9,643,566

Factories	August (pounds)
Barmen	55,906
Berlin	1,052,191
Biebrich	369,846
Dusseldorf	30,985
Frankfurt	1,769,029
Griesheim	755,076
Hoechst	867,997
Leverkusen	2,987,106
Ludwigshafen	1,521,439
Muhlheim	44,976
Uerdingen	189,015
Total	9,643,566

This division is advised from Trade Commissioner F. E. Breithut that the dye production for the month of August was late owing to the considerable delay experienced by the Reparation Commission in obtaining these figures from the Germans.*

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
22	Xylene Light Yellow	17,626
	†Xylene Light Yellow 2G Conc.—(S)	
46	Azophor Orange	10
	Fast Orange R Base Pdr.—(Gr.E)	
48	Alizarine Yellow G	55
	Alizarine Yellow GD—(S)	
58	Alizarine Yellow R	55
	Ultra Orange R—(S)	
88	Acid Anthracene Brown	110
	†Acid Anthracene Brown R—(By)	
118	Geranine	82
	Brilliant Geranine B	
121	Erica B	656
	†Erica B Extra—(A)	
124	Janus Green	10
	*Janus Green B—(M)	
220	Palatine Black	1,000
	Wool Black GRF—(A)	
273	Diaminogene Blue	8,096
	Diaminogene Blue NA—(C)	
274	Diaminogene	1,986
	Diazo Indigo Blue BR—(By)	
	Diazo Indigo Blue 2RL—(By)	
283	Bismarck Brown	2,000
	*Bismarck Brown 4?—(Q)	
296	Cotton Yellow	439
	†Benzo Fast Yellow RL—(B)	
	Cotton Yellow Conc.—(B)	

The designation "†" for competitive and "" for non-competitive indicates the appraisement basis for the assessment of the ad valorem duty in paragraph 28 of the Tariff Act of 1922. Those dyes without designation are doubtful, pending further investigation. The ad valorem rate for competitive dyes is based on the American selling price, as defined in subdivision (f) of section 402 of title IV; the ad valorem rate for non-competitive dyes is based on the United States value as defined in subdivision (d) of section 402 of title IV of the Act of 1922

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
319	Diamine Scarlet	772
	Triazol Red 3B—(Gr.E)	
358	Diphenyd Red	500
	Acetopurpurine 8B—(A)	
408	Azophor Blue	10
	Fast Blue B Base Pdr.—(Gr.E)	
424	Chicago Blue 6B	4,003
	Chloramine Sky Blue FF—(S)	
449	Trisulphon Brown	2,976
	*Trisulphon Brown B Conc.—(S)	
505	Light Green (Yellowish)	88
	Light Green SF Yellowish XX—(B)	
506	Erioglaucine	2,205
	*Erioglaucine AP 545—(G)	
507	Xylene Blue VS	3,002
	Xylene Blue VS Conc.—(S)	
518	Ethyl Purple	2,702
	*Ethyl Violet—(B)	
522	Victoria Blue 4R	331
	Victoria Blue 4R—(I)	
523	Fast Green	1,598
	Fast Green Extra Bluish—(By)	
532	Alkali Violet	10
	Alkali Violet 4BNOO—(Q)	
543	Patent Blue V	2,215
	†Carmine Blue V—(I)	
545	Patent Blue A	1,772
	†Brilliant Acid Blue A—(By)	
	Brilliant Acid Blue FF—(By)	
559	Victoria Blue B	50
	Victoria Blue B Extra Conc.—(Q)	
562	Fast Acid Blue	1,102
	*Fast Acid Blue RBF—(I)	
565	Acid Blue B	200
	†Wool Blue 2B—(A)	
571	Rhodamine 6G	1,384
	Rhodamine 6G Extra—(I)	
	Rhodamine 6GD Extra—(Q)	
	*Rhodamine 6GDX Extra—(Q)	
573	Rhodamine B	1,119
	†Rhodamine B Extra—(Q)	
602	Acridine Yellow	220
	*Acridine Golden Yellow 2G—(L)	
603	Acridine Orange	220
	†Acridine Orange DHE—(DH)	
606	Phosphine	5,968
	*Phosphine 3R—(A)	
	Patent Phosphine G—(I)	
	*Coriphosphine OX Extra—(By)	
608	Euchrysine	83
	Euchrysine GRNTN—(B)	
612	Quinoline Yellow (spirit soluble)	20
	Quinoline Yellow—(By)	
613	Quinoline Yellow	50
	†Quinoline Yellow O—(M)	
618	Thioflavine T	1,000
	Basic Yellow T—(C)	
635	Modern Violet	220
	Modern Violet—(DH)	
637	Gallamine Blue	5,390
	*Gallamine Blue Extra Paste—(G)	
649	Cotton Blue	1,100
	Meldolas Blue 3R Conc.—(S)	
663	New Methylene Blue	417
	New Methylene Blue N—(P)	
700	Nigrosine (soluble in water)	70
	Nigrosine WLG—(B)	
712	Kryogene Yellow G	10
	Sulphur Yellow G Extra—(A)	
734	Pyrogene Yellow	551
	Pyrogene Yellow M—(I)	
759	Anthraflavone G	1,753
	*Anthraflavone G Pst.—(B)	
	*Anthraflavone GC Pdr.—(B)	
	*Anthraflavone GC Pst.—(B)	
760	Indan. Golden Orange G (sgle. stngth.)	6,953
	Indan. Golden Orange G Pst.—(B)	
	*Indan. Golden Orange Dbl. Pst.—(B)	
761	Indan. Golden Orange R (sgle. stngth)	2,915
	*Indan. Golden Orange RR TPst.—(B)	
	*Indan. Golden Orange RR TPdr.—(B)	
	*Indan. Gldn. Orange RRTS Pdr.—(B)	
765	Indan. Green B (sgle. stnght.)	15,165
	†Indan. Black BB Dbl. Pst.—(B)	
	Helindone Black IBB Pdr.—(M)	
767	Indan. Violet RR (sgle. stngth)	300
	†Indan. Violet RR Extra Pst.—(B)	
780	Alizarine Red	12,947
	Alizarine Red S Pdr.—(By)	
	†Alizarine Red SX Pst.—(BAC)	
	†Alizarine Red YCA pst.—(BAC)	
	*Alizarine Red W Pdr.—(By)	
813	Indan. Copper R (sgle. stngth.)	494
	*Indan. Copper R Paste—(B)	
819	Algol Red PFF (sgle. stngth.)	7,637
	*Algol Red FF Extra Pst.—(By)	
	*Algol Red FF Extra Pdr.—(By)	
	*Algol Red R Extra Pdr.—(By)	
	*Vat Brilliant Red 2B Pdr.—(By)	
	Vat Red FF Extra Pst.—(B)	
820	Algol Brilliant Violet R (sgle. stngth)	976
	Algol Brilliant Violet RK Pdr.—(By)	
	*Algol Brilliant Violet R Pst.—(By)	
821	Algol Brilliant Violet 2B (sgle. stngth.)	440
	Algol Brilliant Violet 2B Pdr.—(By)	
822	Algol Brilliant Orange FR (sgle. stngth)	577
	*Algol Brilliant Orange FR Pst.—(By)	
	Algol Brilliant Orange FR Pdr.—(By)	
825	Algol Red B (sgle. stngth)	160
	*Algol Red B Pdr—(By)	

Schultz No.	Name of Dye and Manufacturer	Quantity (pounds)
828	Indan. Claret B (sgle. stngth).....	880
	Indan. Bordeaux B Pdr.—(B)	
831	Indan. Red BN (sgle. stngth).....	161
	Indan. Red BN Extra Pdr.—(B)	
	Indan. Red RK Pst.—(B)	
840	Indan. Blue 3G (sgle. stngth).....	2,160
	†Indan. Blue 3G Pdr.—(B)	
842	Indan Blue GCD (sgle. stngth).....	6,818
	†Indan. Blue GCD Dbl. Pst.—(B)	
	†Indan. Blue GCD Pdr.—(B)	
844	Algol Blue 3G (sgle. stngth.).....	688
	*A'gol Blue 3G Pdr.—(By)	
849	Indan. Yellow (sgle. stngth).....	1,028
	Indan. Yellow G Dbl. Pst.—(B)	
852	Alizarine Irisol	50
	*Alizarine Irisol R Pdr.—(By)	
853	Anthraquinone Violet R Pdr.—(B).....	227
	*Anthraquinone Violet R Pdr.—(B)	
855	Alizarine Pure Blue.....	641
	*Alizarine Sky Blue B Pdr.—(By)	
856	Alizarine Astrol	597
	Alizarine Astrol B Pdr.—(By)	
860	Cyananthrol G	242
	*Cyananthrol BGAOO Pdr.—(B)	
862	Alizarine Blue Black.....	3,334
	†Alizarine Blue Black B Pdr.—(By)	
	†Alizarine Blue Black 3B Pdr.—(By)	
865	Alizarine Cyanine Green.....	730
	†Alizarine Cyanine Green E Pdr.—(By)	
	*Alizarine Cyanine Green 3G Pdr.—(By)	
869	Algol Brown B (sgle. stngth).....	10,420
	*Algol Brown R Pst.—(By)	
	*Algol Brown R Pdr.—(By)	
	*Vat Brown R Pdr.—(By)	
870	Algol Corinth (sgle. stngth).....	710
	*Indan. Pink B Dbl. Pst.—(B)	
	*Vat Corinth RK Pdr.—(By)	
887	Brilliant Indigo 4G.....	225
	*Brilliant Indigo 4G Pdr.—(B)	
893	Alizarine Indigo (sgle. stngth).....	1,619
	*Alizarine Indigo G Pst.—(By)	
	*Alizarine Indigo G Pdr.—(By)	
897	Ciba Heliotrope B (sgle. stngth).....	110
	Ciba Heliotrope B Pst.—(I)	
901	Ciba Violet B (sgle. stngth.).....	4,352
	*Ciba Violet B Pst.—(I)	
	*Ciba Violet B Pdr.—(I)	
907	Ciba Scarlet (sgle. stngth.).....	4,064
	*Ciba Scarlet G Extra Pdr.—(I)	
	*Helindone Fast Scarlet C Pst.—(M)	
	*Helindone Fast Scarlet G Pst.—(M)	
	*Thioindigo Scarlet 2G Pst.—(K)	
908	Ciba Red R (sgle. stngth).....	4,688
	*Ciba Red R Pst.—(I)	
910	Helindone Pink (sgle. stngth).....	440
	*Helindone Pink AN Pst.—(M)	
	Thioindigo Pink AN Pst.—(K)	
913	Helindone Orange R (sgle. stngth.).....	660
	*Thioindigo Orange R Pdr.—(K)	
915	Helindone Fast Scarlet (sgle. stngth).....	1,180
	*Helindone Fast Scarlet R Pdr.—(M)	
	*Helindone Fast Scarlet R Pst.—(M)	
918	Helindone Red 3B (sgle. stngth).....	660
	Helindone Red 3B Pst.—(M)	
919	Ciba Bordeaux (sgle. stngth.).....	551
	*Ciba Bordeaux B Pst.—(I)	
920	Helindone Violet (sgle. stngth).....	165
	Helindone Violet IRR Ex. Pdr.—(M)	
923	Ursol	3,447
	Ursol DB—(A)	
	Ursol Gray B—(A)	
	Ursol Gray R—(A)	
	Fur Brown 2R—(A)	
	*Fur Brown 4R—(A)	
	*Fur Brown SO—(A)	
	Fur Gray B—(A)	
	Fur Olive DA—(A)	
	*Fur Olive 3G—(A)	
	Fur Yellow 2G, 4G—(A)	
	†Paraphenylenediamine—(A)	
	†Fur Black DG—(A)	
	Fur Blue Black SA—(A)	
	Fur Gray Brown SLA—(A)	
	Fur Red Brown 6R—(A)	
	*Fur Yellow Brown 4GL—(A)	

UNIDENTIFIED ACID DYES

Name of Dye and Manufacturer	Quantity (pounds)
*Acid Alizarine Gray G—(M).....	220
*Acid Pure Brown R Supra—(G).....	1,323
Alizarine Rubinol	14,830
*Alizarine Rubinol R Pdr.—(By)	
*Alizarine Rubinol 3G Pdr.—(By)	
*Alizarine Rubinol GW Pdr.—(By)	
*Alizarine Rubinol 5G Pdr.—(By)	
Brilliant Pure Yellow 6G Extra—(By).....	221
Fast Black	610
Fast Black Base Pdr.—(GrE)	
Fast Black LB Base Pdr.—(GrE)	
Guinea Fast Red.....	1,200
Guinea Fast Red BL—(A)	
Guinea Fast Red 2BL—(A)	
*Milling Brown 3G—(A).....	25
Neolan Black 2G—(I).....	110
Neolan Green B—(I).....	220
Neolan Navy Blue.....	66
Neolan Navy Blue 2G—(I)	
Neolan Navy Blue R—(I)	
Neolan Pink G—(I).....	110
Polar Red	4,206
†Polar Red G Conc.—(G)	
*Polar Red R Conc.—(G)	
*Supramine Brown R—(By).....	66

(*Continued on page* 850)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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Lowell Textile School, Lowell, Mass.

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A. K. Johnson, Secretary, Lowell Textile School, Lowell, Mass.

Rhode Island Section—
Ralph F. Culver, Chairman, Box 269, Providence, R. I.
Leslie L. Bamberger, Secretary, U. S. Finishing Company, Providence, R. I.

New York Section—
Elvin H. Killheffer, Chairman, Newport Chemical Works, Passaic, N. J.
Herbert Grandage, Secretary, 121 Willard Avenue, Bloomfield, N. J.

Philadelphia Section—
Robert E. Rose, Chairman, E. I. du Pont de Nemours & Co., Wilmington, Del
Elmert C. Bertolet, Secretary, Philadelphia Textile School, Philadelphia, Pa

SEVENTEENTH COUNCIL MEETING

The Seventeenth Council Meeting of the American Association of Textile Chemists and Colorists was held on Friday, September 28, 1923, at the Engineers' Club in Boston.

The following members were in attendance: L. A. Olney, W. H. Cady, W. C. Durfee, A. E. Hirst, W. R. Moorhouse, G. A. Moran, W. K. Robbins, W. M. Scott, R. F. Culver, Hugh Christison, W. E. Hadley.

The following applicants were elected to Active Membership:

Alling, M. W., 28 Bond Street, Passaic, N. J.
Dyer, Waldrich Bleachery, Delawanna, N. J.

Baldwin, H. W., 35 Crest Avenue, Chelsea, Mass.
Chemist, Sandoz Chemical Works, Boston, Mass.

Bearcovitch, A. J., 242 Willard Avenue, Providence, R. I.
Dyer, Imperial Printing & Finishing Company, Bellefont, R. I.

Briden, L. L., 359 Atlantic Avenue, Boston, Mass.
L. L. Briden & Co.

Hayes, F. A., 431 Prospect Street, Norwood, Mass.
Factory Manager, Lawrence Felting Plant, Millville, Mass.

Johnson, G. H., 303 Rutger Street, Utica, N. Y.
Dyer, McLoughlin Textile Corp., Utica, N. Y.

Johnson, M. T., 6 C Street, Greenville, S. C.
Dyer, Judson Mills, Greenville, S. C.

Rudolph, G. C., 37 Essex Avenue, Bloomfield, N. J.
Colorist, Color Service Corp., New York, N. Y.

Sherburne, E. A., 1540 Pawtucket Avenue, Pawtucket, R. I.
Manager, Geigy Company, Providence, R. I.

Wuth, Berthold, 134 Cedar Street, New York, N. Y.
Chemist, Ciba Company, New York, N. Y.

The following applicants were elected to Junior Membership:

Joerger, R. W., 92 Elsbree Street, Fall River, Mass.
Assistant Chemist, American Printing Company, Fall River, Mass.

Normand, W. S., Jr., 200 Huson Street, New Bedford, Mass.
Student, Bradford Durfee Textile School, Fall River, Mass.

In view of the apparent success which attended the publication of the recently issued Year Book of the Association, the Council voted to publish another Year Book for 1924 and turn the publication of same over to the Howes Publishing Company, with the same terms as existed for 1923.

The resignation of Elwood Hendrick was read and accepted.

Voted, that the service rendered by the Howes Publishing Company, in publishing the proceedings of the American Association of Textile Chemists and Colorists in the American Dyestuff Reporter, has been very satisfactory, and that the same arrangement as has existed during the past two years be extended for another period of two years, beginning November 1,

1923, it being understood, however, that if it is the intention of either party to terminate the present arrangement, one year's notice must be given in writing by either party.

In regard to the invitation of the Rhode Island Section, given through their Chairman, R. F. Culver, it was voted to hold the Annual Meeting in Providence on Saturday, December 8, 1923. It was suggested that possibly the Rhode Island Section could arrange to hold a meeting on Friday, December 7, which would include those members of the Association who had already arrived for the Annual Meeting.

The Secretary is about to send out notices of the Annual meeting, together with ballots for the nomination of officers to be elected thereat.

The report of the emblem committee, R. F. Culver, Chairman, was accepted and the committee continued with further instructions.

The Secretary was authorized to look into the matter of suitabe badges for the coming annual meeting.

W. E. Hadley, Secretary.

SIXTEENTH RESEARCH COMMITTEE MEETING

The sixteenth meeting of the Research Committee of the American Association of Textile Chemists and Colorists was held at the Engineers' Club in Boston on Friday, September 28, 1923.

The following members were in attendance: L. A. Olney, W. H. Cady, W. C. Durfee, A. E. Hirst, W. R. Moorhouse, G. A. Moran, W. K. Robbins, W. M. Scott, R. F. Culver, H. Christison, W. J. Murray, W. E. Hadley.

W. H. Cady, Chairman of the Committee on Fastness to Light, reported progress, but requested more time in which to perfect the details of the report of his committee.

H. Christison, Chairman of the Committee Investigating Perspiration, reported progress, but the committee has nothing to offer for publication at the present time.

W. E. Hadley, Secretary.

GENERAL NOTICE

In accordance with the Constitution, any contemplated Amendments to the Constitution or By-Laws, to be acted upon at the coming Annual Meeting, should be immediately forwarded to the Secretary.

MINUTES OF THE OCTOBER MEETING PHILADELPHIA SECTION

The first Fall Meeting of the Philadelphia Section, American Association of Textile Chemists and Colorists, was held Friday, October 12, 1923, in Philadelphia. At 6.45 P. M., fourteen members sat down to dinner at the City Club of Philadelphia where an enjoyable time was had. At 8.30 P. M. the meeting was called to order by Secretary Bertolet in absence of the Chairman, Dr. Rose. A. R. Thompson, Jr., was appointed Secretary.

A letter was read from Dr. Rose who has been ill since January, in which the latter expressed his best wishes for the Section in the coming months, and requested that his name be not considered for re-election.

The minutes of the May 4th meeting were read and approved.

The Sectional Committee reported a meeting held at the City Club at which time the meeting of this evening was planned.

A nominating committee consisting of Messrs. Mullin, Chairman, Medde and Thompson was appointed to nominate officers and Sectional Committee for the coming year.

Mr. Bertolet called for suggestions from any of those present on how to improve the meetings of the Section.

The Managing Director of the Philadelphia Textile Association, Mr. Banister, was introduced, and voiced his willingness to co-operate with the Section in any way possible.

J. L. Wade, of the Aberfoyle Manufacturing Company, Chester, Pa., read a very interesting paper on the bleaching of Cotton Warps, dividing the subject into three parts, (1) Preparation of the Yarn, (2) Kier Boiling, (3) The Bleaching Operation Itself. (This paper is published in full herewith, beginning on page 843.)

Mr. Boger, of the Boger & Crawford Company, of Philadelphia, gave of his experience on the bleaching of mercerized cotton yarn, and also recommended an exchange of ideas at these meetings with the object in view of helping the other fellow and in return being helped by him.

John McAdam, Jr., of the Joseph Bancroft & Sons Company, of Wilmington, Del., spoke very interestingly on the "Bleaching of Cotton Piece Goods" as carried out in the rope form. (This paper will be published in the Proceedings in the near future.)

The Nominating Committee reported as follows:

For Chairman, C. S. Hollander, C. F. Goldthwait.

For Secretary, P. Theel, Elmer C. Bertolet.

For Sectional Committee, Ralph McIntyre, C. F. Goldthwait, W. J. Wall, R. E. Rose, C. E. Mullin, C. S. Hollander.

Election to take place at the December Meeting.

(*Continued on page* 843)

Proceedings of the American Association of Textile Chemists and Colorists

FADING LAMPS*

How the Mercury Arc Was Made to Imitate Sunlight

Resume of Results Previously Published—New Experiments with Silk and Wool—Behavior of Chrome Colors—The Equalizing Effect of Crown Glass—Results Expected from Cobalt-Nickel Glass—Method of Maintaining Constant Intensity of Fading Energy

By OSCAR R. FLYNN

Consulting Textile and Dye Chemist

The Need of a Rapid Method for Testing Light Fastness

SEVERAL years ago we had occasion to dye in light-fast cotton colors a quantity of "repp" to be used for draperies. We had promised delivery on part of the order at such an early date that there was not sufficient time to submit preliminary dyeings to sunlight, the difficulty being further increased by the fact that some of the dyes which we contemplated using were of American make and by us hitherto untested in the combinations which we expected to make. At this juncture we decided to make use of a quartz mercury arc lamp and to expose our preliminary dyeings to its powerful rays along with the customer's samples. This we did and, later exposing the same dyeings to sunlight, found happily that we had not been misled.

Comparison of the Mercury Arc Fadings with Sunlight Fadings

The comparative light tests started in this way were continued. For a long time each dyeing made in the laboratory was subjected to a comparative light test. The dyeings were pasted on sheets of paper, about twenty strips to a sheet, and exposed to the rays of the mercury arc in such a way that a half-hour's fading was registered on a third of each strip. They were then exposed in a south window so that another third of each strip became faded by sunlight, the exposure being continued from day to day until the sun fade on an "indicator strip" of Scarlet 8BS, which formed a part of each set, was made to balance the mercury arc fade on this indicator strip.

These doubly faded strips afforded material for a preliminary study of the mercury arc fadings in comparison with sunlight.

*A paper read at the meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists on October 19, 1923

Peculiarities of the Mercury Arc Fade on Dyed Cotton

An examination of these fading sets shows that direct cotton dyes on cotton have faded many times faster by mercury light than by sunlight, but that the fadings for the most part "balance." The balance is, of course, conditioned by the fact that a direct cotton dye—viz., the Scarlet 8BS—was used as an indicator.

The so-called L brands of cotton dyes (dyes of superior light fastness) do not show balanced fadings, but are faded proportionately more by the mercury arc than by the sun. In passing, it might be stated that at the time the work was being done it was noted that some of these dyes, especially the red, exhibited a purplish effect in the mercury arc fade which disappeared, however, in the dark, leaving a fade of the same general character as the sun fade. Some of the yellows also showed temporary darkening, which also disappeared after the strips were removed from the vicinity of the lamp.

In the case of the majority of the sulphur colors, the time was too short to register any noticeable change. Sulphur Black is seen, however, to have faded like the L brands of cotton colors, proportionately more under the mercury arc than in the sun. Columbia Black FF shows exactly the reverse effect.

The greatest variation, however, is found in the behavior of the basic colors. Without exception, those tested were found to have faded very materially less under the mercury arc than in the sun, owing to the fact, already noted, that a direct dye was used as the standard.

The order of fastness of the cotton and sulphur dyes by the mercury arc is practically the same as the order of fastness by sunlight, but the differences in fastness between the various dyes are less. The basic dyes, however, if inserted in these lists would be near the top of the first list and near the bottom of the second.

Tentative Explanation of the Reversal in Fastness of the Basic Dyes

In attempting an explanation of the peculiar behavior of the basic dyes under the mercury arc, it became apparent that there must be at least two actions going on during fading, which we may call "A" and "B" effects. Both of these actions are accelerated by an increase in the intensity of the fading light, the "A" effect, however, being much more accelerated than the "B." The "A" effect is the one more prominent in the fading of the direct colors; the "B" seems to predominate in the fading of the basic colors. Recalling the fact that the majority of the direct cotton colors are easily destroyed by reduction, and that the basic colors when not too violently reduced are generally capable of being restored by subsequent oxidation, it naturally occurred to me (as it has to others) that the "A" effect was a reducing action in which the cotton itself played the part of a reducing agent. I was influenced in forming this hypothesis by the fact that Indanthrene Yellow G, which forms a blue leuco body, becomes green when exposed to the mercury arc and again becomes yellow when withdrawn from its influence; the first effect being clearly the result of the presence of the blue leuco substance mixed with unchanged dye, and the second to the disappearance of the blue leuco substance through oxidation back to the original yellow.

Harrison's Experiments and Conclusions

A search made through the files of the Journal of the Society of Dyers and Colorists soon revealed that exactly the same conclusion had been presented to that society by William Harrison on March 22, 1912. (See the July, 1912, number of the Journal of the Society.)

In a series of experiments made with dyes of different constitution, dyed on cotton or filmed on glass, and exposed to the mercury arc in sealed quartz tubes or to the sun in sealed glass tubes, Harrison was able to prove to his own satisfaction (a) that dyestuff is not affected by light alone, the presence of air or fiber, or both, being necessary for fading; (b) that azo dyes do not require air, but in intense light fade by contact with cotton alone; (c) that non-azo dyes—that is, dyes not capable of being destroyed by moderate reduction, are not permanently faded unless air is present, fading equally as well when filmed on glass as when dyed on cotton.

These observations, together with the results of tests showing the formation of oxycellulose in the cotton in contact with the faded dye, led him to conclude that the rapid fading of azo cotton dyes and similar easily reducible dyes was due to the reducing action of the cotton itself, and that the fading of non-azo dyes was mainly due to oxidation.

Oxidation Assists Reduction

Harrison also made this very important point, viz.: that the reducing action of cotton falls off rapidly with decrease of intensity of the fading light, and when the latter reaches the intensity of sunlight it practically disappears, so much so that direct cotton dyes require *indirectly* the assistance of oxygen in order to fade by sunlight.

He explains that cellulose in contact with direct cotton dyes under the influence of the sunlight is not sufficiently active to cause fading, but partially oxidized cotton is sufficiently active. In the ordinary fading of direct cotton colors under the action of sunlight, cotton is first changed into oxycellulose, which in turn acts reducingly upon the dyes.

In understanding what at first seems a paradox, it should be recalled that the behavior of oxycellulose with Fehling's solution shows that it has greater reducing power than cellulose itself, just as the oxidation products of alcohols—viz., the aldehydes—are more strongly reducing than the alcohols from which they are derived. It is also known that in the oxidation of cotton, both soluble and insoluble substances with strong reducing powers are formed; the soluble part, penetrating the fiber, is able to carry the destructive reducing action into the interior of the fiber itself, so that the oxidation and reduction, which cause fading, need not necessarily be going on in exactly the same location in space.

The Unequal Acceleration of the "A" and "B" Action Explained

Returning to a consideration of the unequal acceleration of the "A" and "B" effects, which we now definitely identify as reduction and oxidation, it must be understood that an increase in fading intensity accelerates the oxidizing effect only slowly, or we may say in approximately arithmetic ratio because of the slight density of oxygen in the air; but when, with increased energy of fading, the stage is reached where the cellulose itself begins to act as a reducing agent, owing to its greater density and more intimate contact with the dye, its chemical effectiveness increases at a much greater rate than the activity of the oxygen—viz., in something like a geometric ratio. Hence we find that, with increasing intensity of a fading light, the dyes fading principally by reducing become relatively much more fugitive than those which fade mainly by oxidation.

This theory of fading is borne out by the results of a series of exposures made by Harrison on cotton dyed

with direct and basic colors. In these exposures three grades of fading intensity are used, of which the sun represents the lowest, a 110-volt mercury arc the intermediate, and a 220-volt mercury arc the highest intensity. The dyeings were exposed as a group to each source of illumination until the most fugitive was almost completely destroyed by the particular light in question. The diagrammed results show that the reducible cotton dyes are progressing less fast as we pass from the sun fading to the 110-volt mercury arc fading, and from there to the 220-volt mercury arc fading. (See Am. Dyestuff Rep., Vol. XII, p. 294.)

A Limit to the Speed of Artificial Sun Fading

If the theory of the chemistry of fading just outlined is correct, there is a limit to the speed at which fading tests may be made with results which parallel those of sun fading. This limit is the fading intensity which starts a chemical action between the azo dyes and the cellulose. When this limit is passed, there is bound to be a divergence between the "non-reducible" and "reducible" type of dye. Therefore, in correcting the anomalous behavior of the mercury arc it should be necessary, first of all, to cut down its rate of action to something like that of sunlight.

Following out this idea, a set of fading tests was made to show the comparative effect of sunlight, mercury arc light applied directly, and mercury arc light moderated by filtering through 1¼ mm. of crown glass.

A selection of typical direct and basic colors dyed on cotton was exposed together so as to register on each swatch just forty-eight hours of winter sunlight. They were then exposed respectively to one-half hour and to one hour of direct mercury arc light, and finally to twenty hours of mercury arc light tempered by crown glass, the results of these exposures being registered on different parts of the same strip of dyed cotton. The length of time of the exposure through glass was regulated so as to make the resulting fade on the Scarlet 8BS indicator strip balance the sunlight fade. The outcome of this series of exposures confirmed the theory of fading in a very complete and satisfactory manner. When the indicator dyeing had been brought to an even fade with sunlight, it was found that all the other dyeings, both basic and direct, were likewise in almost perfect balance. Incidentally, the untempered arc fadings registered on the same swatches show conspicuously the reversals in fading characteristic of direct and basic colors exposed to rapid fading. The

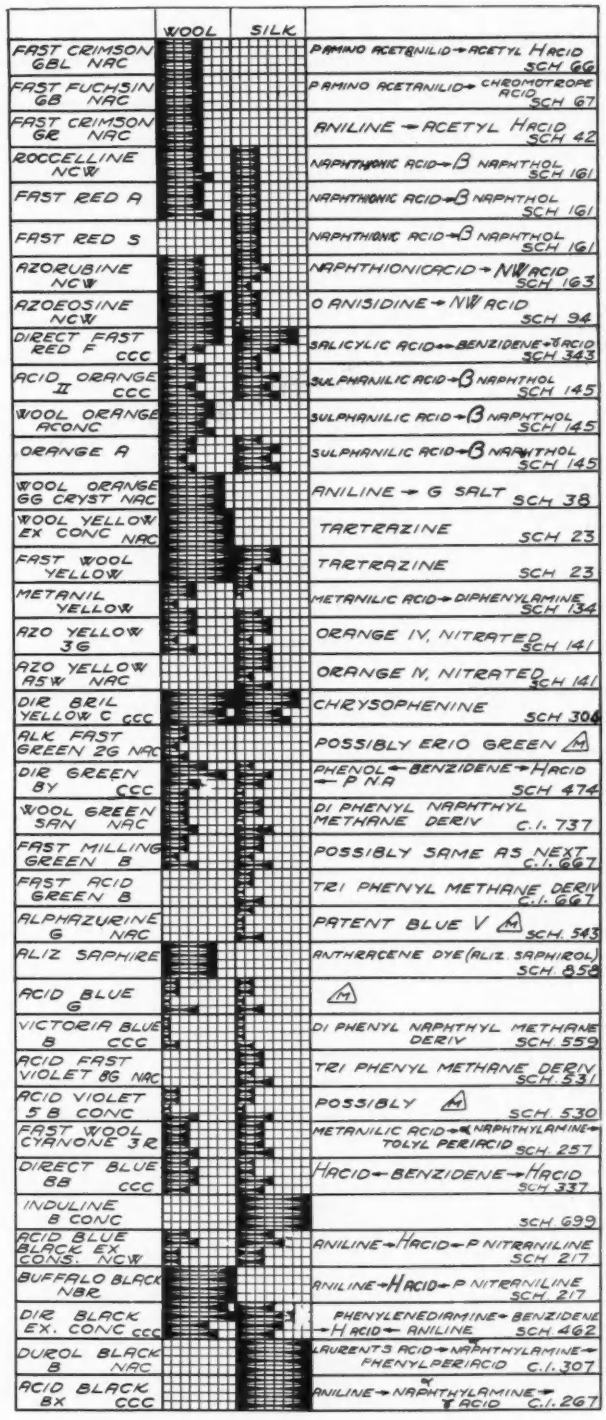
WOOL
SILK
FAST CRIMSON GBL NAC
P AMINO ACETANILID → ACETYL H ACID SCH 66
FAST FUCHSIN GB NAC
P AMINO ACETANILID → CHROMOTROPE ACID SCH 67
FAST CRIMSON GR NAC
ANILINE → ACETYL H ACID SCH 42
ROCCELLINE NCW
NAPHTHIONIC ACID → β NAPHTHOL SCH 161
FAST RED A
NAPHTHIONIC ACID → β NAPHTHOL SCH 161
FAST RED S
NAPHTHIONIC ACID → β NAPHTHOL SCH 161
AZORUBINE NCW
NAPHTHIONIC ACID → NW ACID SCH 163
AZOEOSINE NCW
O ANISIDINE → NW ACID SCH 94
DIRECT FAST RED F CCC
SALICYLIC ACID ← BENZIDENE → H ACID SCH 343
ACID ORANGE II CCC
SULPHANILIC ACID → β NAPHTHOL SCH 145
WOOL ORANGE R CONC
SULPHANILIC ACID → β NAPHTHOL SCH 145
ORANGE A
SULPHANILIC ACID → β NAPHTHOL SCH 145
WOOL ORANGE GG CRYST NAC
ANILINE → G SALT SCH 38
WOOL YELLOW EX CONC NAC
TARTRAZINE SCH 23
FAST WOOL YELLOW
TARTRAZINE SCH 23
METANIL YELLOW
METANILIC ACID → DIPHENYLAMINE SCH 134
AZO YELLOW 3G
ORANGE IV, NITRATED SCH 141
AZO YELLOW RSW NAC
ORANGE IV, NITRATED SCH 141
DIR BRIL YELLOW C CCC
CHRYSOPHENINE SCH 306
ALK FAST GREEN 2G NAC
POSSIBLY ERIO GREEN M
DIR GREEN BY CCC
PHENOL ← BENZIDENE → H ACID ← P NA SCH 474
WOOL GREEN SAN NAC
DI PHENYL NAPHTHYL METHANE DERIV C.I. 737
FAST MILLING GREEN B
POSSIBLY SAME AS NEXT C.I. 667
FAST ACID GREEN B
TRI PHENYL METHANE DERIV C.I. 667
ALPHAZURINE G NAC
PATENT BLUE V M SCH. 543
ALIZ SAPHIRE
ANTHRACENE DYE (ALIZ. SAPHIROL) SCH. 858
ACID BLUE G
M
VICTORIA BLUE B CCC
DI PHENYL NAPHTHYL METHANE DERIV SCH. 559
ACID FAST VIOLET 6G NAC
TRI PHENYL METHANE DERIV SCH. 531
ACID VIOLET 5 B CONC
POSSIBLY M SCH. 530
FAST WOOL CYANONE 3R
METANILIC ACID → NAPHTHYLAMINE → TOLYL PERIACID SCH. 257
DIRECT BLUE 6B CCC
H ACID ← BENZIDENE → H ACID SCH 337
INDULINE B CONC
SCH 699
ACID BLUE BLACK EX CONS. NCW
ANILINE → H ACID → P NITRANILINE SCH 217
BUFFALO BLACK NBR
ANILINE → H ACID → P NITRANILINE SCH 217
DIR BLACK EX. CONC CCC
PHENYLENEDIAMINE → BENZIDENE → H ACID ← ANILINE SCH 462
DUROL BLACK B NAC
LAURENT'S ACID → NAPHTHYLAMINE → PHENYLPERIACID C.I. 307
ACID BLACK BX CCC
ANILINE → NAPHTHYLAMINE → H ACID C.I. 267
100 HRS. MAY JUNE DIRECT SUNLIGHT
85 HRS. HG. QUARTZ ARC THROUGH 1½ MM. CROWN GLASS FILTER.
75 HRS. VIOLET FLAME ARC THROUGH GLASS GLOBE.
6 HRS. DIRECT HG. QUARTZ ARC.

Fig. 1

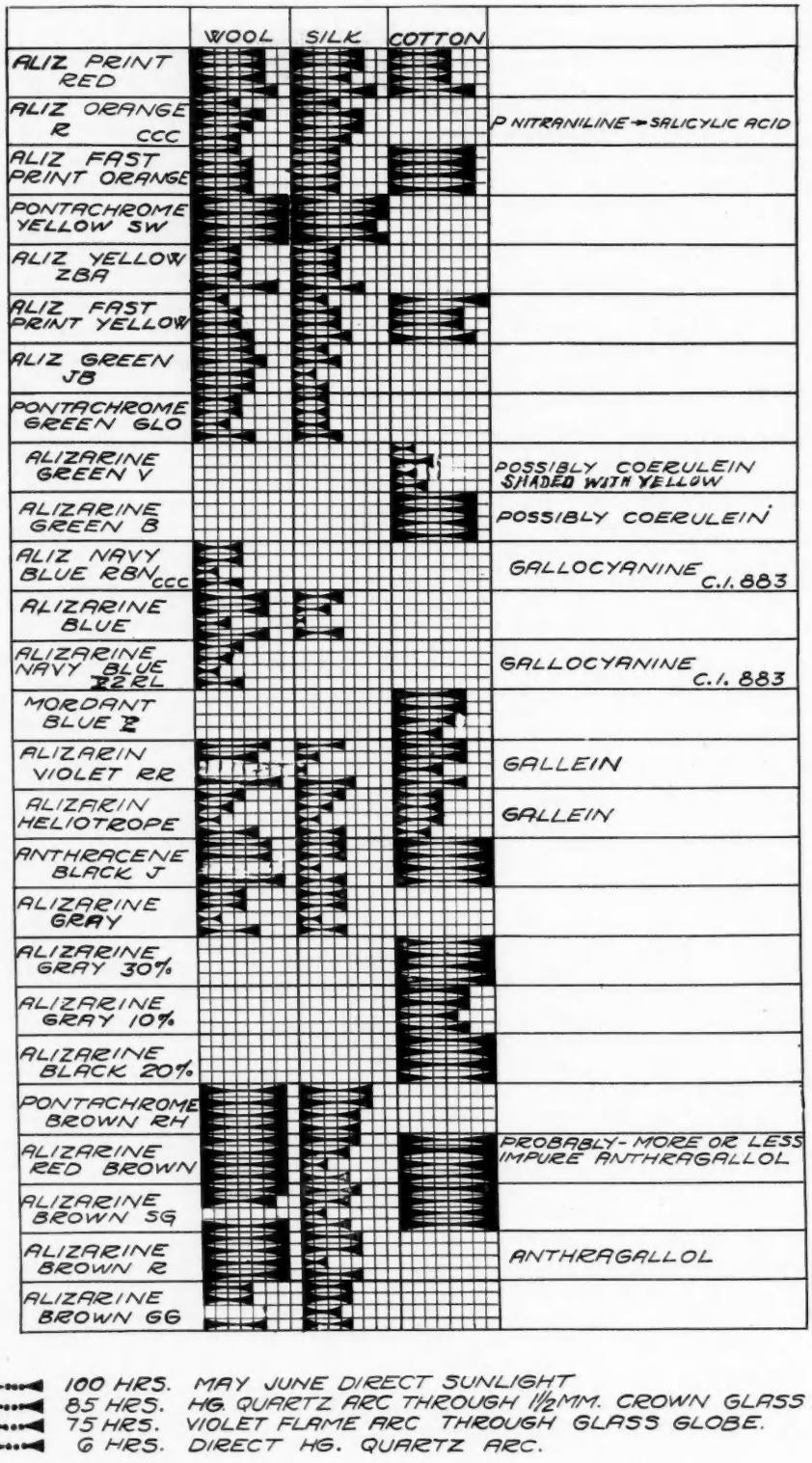

FIG. 2

case of Bismarck Brown, a basic azo dye, is especially interesting. Corresponding to its reducible nature, it is seen to be much more affected by the direct mercury arc than are the non-azo basic colors. (See diagram, Am. Dyestuff Rep., Vol. XII, p. 295.)

FADING OF COLORS ON SILK AND WOOL

The fact that direct cotton colors, even Congo Red, are much faster on silk and wool than on cotton tends to show that animal fibers do not exert as much reducing action as cotton. Therefore, the problem of equalizing the fading of the reducible and non-reducible dyes on animal fibers should be even easier of solution.

A set of dyeings on silk and wool made principally with acid colors but containing some direct colors, and at least one basic color, was suitably exposed and made to register 100 hours of May and June sun, 85 hours of 220-volt mercury arc through crown glass, 75 hours of carbon arc through glass and 6 hours of direct untempered mercury arc. The May and June sun was allowed to act direct, exposures being made in the middle of the day from 9.00 to 3.00 and an accurate tally kept. The distances of the mercury and carbon arcs were respectively 9 and 11 inches. The times of exposure to the different sources of artificial light were determined in each case by the course of the fading, the exposure being terminated on all samples when the larger proportion of the fadings balanced the corresponding sun fadings.

A study of these results shows, among

other things, that dyed wool and silk faded with the untempered mercury arc exhibit fewer anomalies than dyed cotton faded in the same way. It is interesting, however, to note that dyes of the triphenyl methane type, both basic and acid, show a retardation similar to but not as great as the retardation of triphenyl methane basic colors on cotton.

The results show also that the tempered mercury arc fadings are somewhat more uniform than those of the violet carbon arc, although either one might be said to give a sufficiently close approximation to the true sun fastness. It is noticeable that the carbon arc, unlike the mercury arc, produces an acceleration in the fading of the triphenyl methane dyes rather than a retardation. It is a question whether the greater irregularity of the carbon arc fadings over the tempered mercury arc fadings may not be due to the somewhat excessive heat generated, the energy dissipated from the carbon arc being some three or four times greater than the energy from the mercury arc. That high temperature should influence fading is quite to be expected when we consider that most dyes are decomposable hydrates.

The results of this set of tests have been tabulated in Fig. 1. In this table (also in Figs. 2 and 3) the shaded area which shows the result of a particular fading represents residual dye. Where the shading covers eight of the small squares, the indication is that no fading was noticeable.

Chrome Colors Dyed on Wool, Silk and Cotton

Knowing the rather remarkable influence of certain metals on the fastness of dyes, it was felt to be desirable that the effect of tempering the mercury arc should be tested on chrome colors. A number of such colors dyed on wool and silk and printed on cotton were subjected to the same sort of exposures as the dyes just described, the exposure times, distances, etc., being exactly the same. Nothing remarkable, however, was noted in this connection except possibly even greater ir-

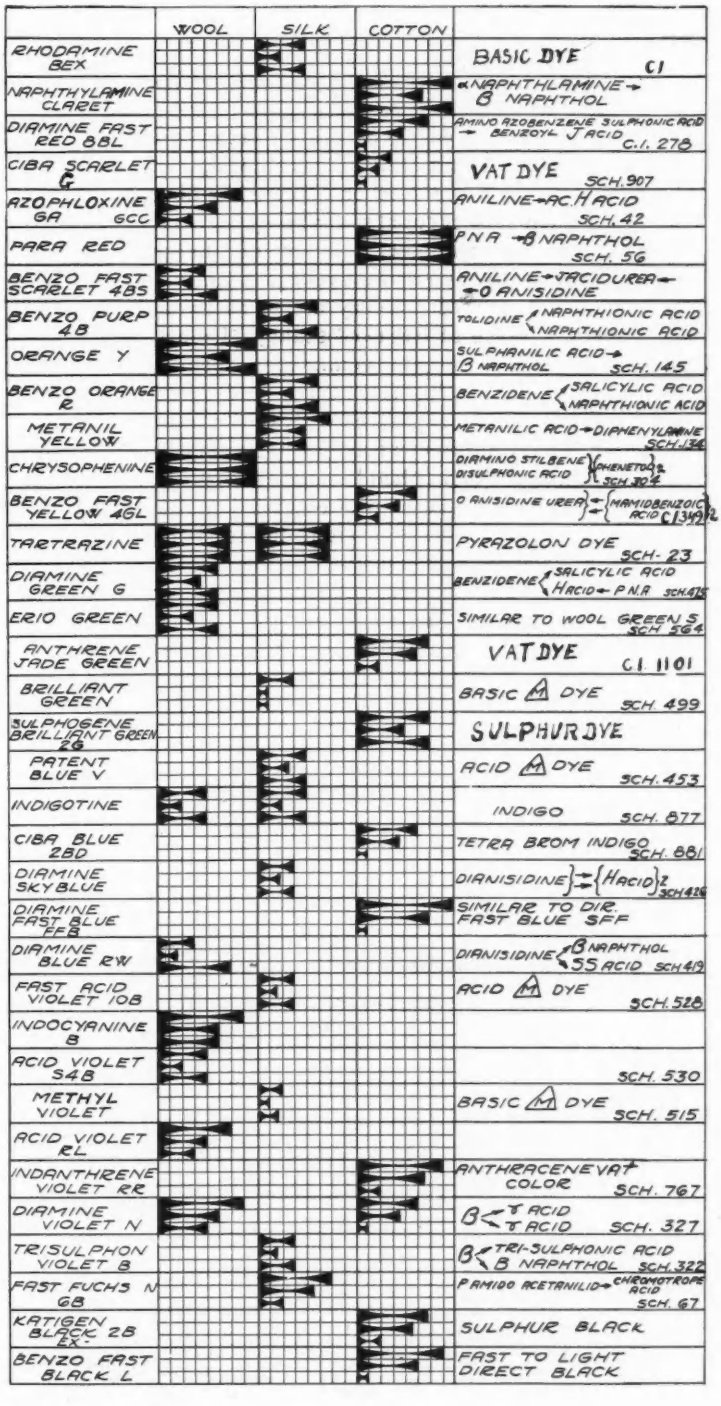
WOOL
SILK
COTTON
RHODAMINE BEX
BASIC DYE C.I.
NAPHTHYLAMINE CLARET
α NAPHTHYLAMINE → β NAPHTHOL
DIAMINE FAST RED 8BL
AMINO AZOBENZENE SULPHONIC ACID → BENZOYL J ACID C.I. 278
CIBA SCARLET G
VAT DYE SCH. 907
AZOPHLOXINE 6A GCG
ANILINE → AC. H ACID SCH. 42
PARA RED
PNA → β NAPHTHOL SCH. 56
BENZO FAST SCARLET 4BS
ANILINE → JACID UREA → O ANISIDINE
BENZO PURP 4B
TOLIDINE { α NAPHTHIONIC ACID, β NAPHTHIONIC ACID
ORANGE Y
SULPHANILIC ACID → β NAPHTHOL SCH. 145
BENZO ORANGE R
BENZIDENE { SALICYLIC ACID, NAPHTHIONIC ACID
METANIL YELLOW
METANILIC ACID → DIPHENYLAMINE SCH. 134
CHRYSOPHENINE
DIAMINO STILBENE DISULPHONIC ACID { PHENETOL SCH. 304
BENZO FAST YELLOW 4GL
O ANISIDINE UREA { MAMIDBENZOIC ACID C.I. 349
TARTRAZINE
PYRAZOLON DYE SCH. 23
DIAMINE GREEN G
BENZIDENE { SALICYLIC ACID, H ACID → P.N.A. SCH. 415
ERIO GREEN
SIMILAR TO WOOL GREEN S SCH. 564
ANTHRENE JADE GREEN
VAT DYE C.I. 1101
BRILLIANT GREEN
BASIC (M) DYE SCH. 499
SULPHOGENE BRILLIANT GREEN 2B
SULPHUR DYE
PATENT BLUE V
ACID (M) DYE SCH. 453
INDIGOTINE
INDIGO SCH. 877
CIBA BLUE 2BD
TETRA BROM INDIGO SCH. 881
DIAMINE SKY BLUE
DIANISIDINE { H ACID SCH. 426
DIAMINE FAST BLUE FFB
SIMILAR TO DIR. FAST BLUE SFF
DIAMINE BLUE RW
DIANISIDINE { β NAPHTHOL, 55 ACID SCH. 419
FAST ACID VIOLET 10B
ACID (M) DYE SCH. 528
INDOCYANINE B
ACID VIOLET 5 4B
SCH. 530
METHYL VIOLET
BASIC (M) DYE SCH. 515
ACID VIOLET RL
INDANTHRENE VIOLET RR
ANTHRACENE VAT COLOR SCH. 767
DIAMINE VIOLET N
β { γ ACID, γ ACID SCH. 327
TRISULPHON VIOLET B
β { TRI-SULPHONIC ACID, β NAPHTHOL SCH. 322
FAST FUCHS N GB
P AMIDO ACETANILID → CHROMOTROPE ACID SCH. 67
KATIGEN BLACK 2B EX.
SULPHUR BLACK
BENZO FAST BLACK L
FAST TO LIGHT DIRECT BLACK
100 HRS. MAY JUNE DIRECT SUNLIGHT
72 HRS. HG. QUARTZ ARC THROUGH 1¼ MM. CROWN GLASS FILTER
4 HRS. DIRECT HG QUARTZ ARC.
(M) = TRI PHENYL METHANE OR SIMILAR DERIVATIVES.

Fig. 3

regularities in the results of the carbon arc exposure. (See Fig. 2.)

An Assortment of Dyes on Cotton, Silk and Wool

While these tests were in progress we received an assortment of dyeings consisting of direct, acid, basic, sulphur, vat and ice colors dyed on appropriate fibers. These dyeings had been exposed so that they registered an equal but unknown number of hours of sunlight. We were expected to expose the dyeings to both the tempered and untempered mercury arc so as to produce a general average of balanced fading. Unfortunately, it was assumed by the young man operating the fading cabinet that they had had 100 hours of sun. He started his tempered arc exposures with this in mind, and did not discover his mistake until seventy-five hours of tempered arc fading had been registered. The fading with the direct mercury arc was carried on more circumspectly and terminated at four hours with a fair degree of balance, which would seem to indicate that the samples should have had about fifty-six hours of tempered arc fading rather than seventy-five hours.

The principal interest of this set is in the presence of sulphur, vat and ice colors not included in the other sets. Making allowances for overexposure, it will be seen that these dyes behave quite uniformly under the tempered arc. It is also interesting to note the fact that the vat colors in the set are not remarkably fast even to sunlight. (See Fig. 3.)

Commercial Samples of Silk

As a practical test for the effectiveness of the mercury arc tempered with crown glass, a set of commercial samples furnished by a large silk-dyeing concern was subjected to a balanced fading test. On examining these fadings it will be seen that in every case the eighty-five hours of tempered arc fading match the one hundred hours of May and June sun fading with sufficient closeness to give a true index of the relative fastness of the dyeings.

Further Improvements in the Tempered Mercury Arc

In fading, we are concerned with the chemical reactions between the dye and the fiber (or its oxidation products, more particularly in the case of cotton) and with the oxidation of the dye itself.

Now, while theoretically all light has chemical effect, the dyed fabric, the atmosphere, and the photographic plate are all affected most by the ultra-violet, and then in a rapidly lessening degree by the violet and blue, the action of green, yellow, orange and red being negligible.

The photograph of the spectrum of the mercury arc shows a bright band in the region of the blue. The light which causes this band delivers its chemical energy to dyes which absorb it, and thereby increases to a slight degree their liability to fade. Hence, the mercury arc should, even in its tempered form, show

Mercury light filtered through quartz and different kinds of glass. G86B corresponds very nearly to crown glass. G586A corresponds to Cobalt-Nickel glass.

Fig. 4

a somewhat increased action on the dyes which absorb the blue and a lessened action on those which transmit it, and there seems to be evidence of some slight effect of this kind in the fadings recorded in the tables. In several instances in the tempered arc fadings, greens, blues and violets (dyes which transmit a certain proportion of blue) show a relative retardation.

With the possibility of further increasing the value of the tempered mercury arc as a source of artificial fading light, we have decided to try the effect of eliminating this blue line altogether by means of a filter tinted with the oxides of cobalt and nickel (see Fig. 4). A series of fadings are now being prepared which will show the effect of the mercury arc tempered by a filter of this description. The results of this series of tests we hope to have ready some time in the near future.

EQUALIZING THE INTENSITY OF THE MERCURY ARC

Among other improvements in the operation of the mercury arc is the method by which the fall in ultraviolet intensity due to the mellowing of the lamp is corrected. This mellowing or aging takes place principally during the first 500 hours of operation. It has been found that starting a new 220-volt lamp with 160 volts drop in the arc proper and increasing the voltage drop at the rate of 2 volts per 100 hours of operation during this period of mellowing compensates almost exactly for the falling off in fading power of the tempered arc due to this aging. After the first 500 hours no further change is necessary during the remaining several thousand hours of the life of the lamp.

PHILADELPHIA SECTION

(*Continued from page* 836)

Dr. Hollander, By-laws Committee, read the proposed by-laws and these were considered part by part and ordered revised with certain changes incorporated and the same to be presented at the December meeting for ratification.

A motion of thanks was passed, thanking the two speakers, Messrs. Wade and McAdam for the kindness shown us in the presenting the papers of the evening. The Secretary was asked to convey this message in writing to the speakers who had found it necessary to depart early.

Adjournment 10.30 P. M. Present 40. The most interesting meeting that the Philadelphia Section up to this time has held.

A. R. THOMPSON, JR.
Secretary.

FIRST FALL MEETING OF RHODE ISLAND SECTION

The first fall meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held at the rooms of the Providence Engineering Society on Friday evening, October 19, 1923.

The meeting was opened at 8.20 p. m. by Chairman Ralph F. Culver, who stated that the annual meeting of the society would be held in Providence on December 8 with possibly an informal gathering of some sort on the evening of the seventh. All meetings and the banquet will be held in the Biltmore Hotel.

The Chairman appointed the following members to act as a committee in arranging the details of entertainment, and to co-operate in every possible way with the national officers in making the annual meeting a success: B. B. Fernald, Chairman; Dr. Robert K. Lyons, and Arthur E. Hirst.

As no further business was brought forward, the chairman then introduced the Chief Chemist of the Waldrich Bleachery, Dr. Oscar R. Flynn, who gave a very interesting illustrated talk on "Fading Lamps." The attendance was about one hundred.

L. L. BAMBERGER, Secretary.

COTTON WARP BLEACHING*

By J. L. WADE
Aberfoyle Manufacturing Company

I will discuss the bleaching of cotton warps by dividing the process into three operations:

1. Preparing the yarn mechanically into convenient form for processing.

2. Kier boiling to prepare the yarn chemically for bleaching.

3. The bleaching operation itself.

In operation No. 1 either of two methods is used. In the first and probably the one more commonly used, the warps are linked either by hand or by a machine designed for this work. The second method consists in binding the warps with a spiral binder. It has been our experience that for cloth making this second or spiral winding method has proven the better, as the breakage, tangles and wrapping of the warps on rollers in subsequent dyeing or sizing are materially reduced. Its advantage naturally extends into quilling and beaming. The operations in these departments proceed more satisfactorily due to the better condition of the warp.

This spiral binding is done in one run through a machine in which either three or four warps are individually bound, as well as a multiple binder being

*A paper read before the Philadelphia Section of the American Association of Textile Chemists and Colorists on October 4.

placed around the set of three or four warps. The machine processes either twenty-four or thirty-two warps in one operation, depending upon the length of the sets.

The second operation—that of kier boiling—is indeed the most important process in bleaching, and particularly so in bleaching with chlorine, or rather with hypochlorites prepared from chlorine, which method is almost universally used in bleaching of cotton warps.

Cotton is a fiber which represents a cellulose of a high degree of purity, but there is present from 6 to 8 per cent of other constituents which consist of oil, wax, fat, pectin, proteids and mineral matter. It is these with which kier boiling is particularly concerned, as they are very effectively removed in this operation when properly conducted, which consists in boiling the yarn under pressure with a circulating solution of alkalies.

This process is both chemical and mechanical. The fatty matter contained in cotton belongs chiefly to a class of compounds known as waxes, and fats and waxes are either saponifiable or unsaponifiable, a saponifiable one being capable of being decomposed into glycerine or a higher alcohol and an alkali salt of the fatty acid present when boiled with an alkali. An unsaponifiable fat is not so affected, but both of these types of fatty matter are capable of being emulsified; that is, subdivided minutely and suspended in the proper medium.

Proteids—another undesirable constituent—are nitrogenous compounds existing in cotton which act as an enveloping and waterproofing agent to fats and waxes. These bodies are, however, themselves quite soluble in alkalies, as are also the pectins or mucilaginous substances.

So, in general, kier boiling or chemically preparing the yarn consists in dissolving protein and pectin matter and saponifying and emuslifying of fatty matter, thereby removing them from the fiber.

The chemical employed is caustic soda, together with the so-called "kier assistants," such as soluble oils, or mixtures of soluble oils, soaps, phenols and terpenes, which by the penetrating properties assist in the before-mentioned saponification and emulsification. The caustic content of the boil-off liquors should be above one-half of 1 per cent solution and about one-quarter of 1 per cent of the assistant, depending upon the nature of the assistant used. It will be found that about ½ gallon of liquor will be required to a pound of yarn in the circulating type of kier.

A few of the fundamentals to be observed for efficient kier boiling I will mention in brief detail; they are of vast importance, for many of the bleaching difficulties revert back to some improper functioning of the kier boil. The water supply is probably the most important to be considered, both for the kier boiling and bleaching operations, as a poorly filtered or clarified water is the worst enemy to good bleaches. The water should not only be well clarified, but it should be as soft as possible, for many of the compounds which are removed by the boil-out liquor are precipitated on the yarn by hard water in the washing after kier boiling. The water should also show a low iron content, as iron precipitated on fiber during the kier boil, it is believed by some investigators, acts as a catalyzer when later transferred to the bleach, both causing an overoxidizing and tendering of the fiber at those points where the iron was deposited. It may be of interest to quote some figures as obtained by Kind in this connection. His experiments were conducted to show the action of metallic stains as seriously affecting bleaching, after having traced tender spots in goods after bleaching which had deposited ferric oxide in the unbleached fabric. He found that most metals increase the activity of bleach liquors, and that copper and iron were particularly effective. It was found that, for example, a feebly alkaline bleach liquor lost 4.2 per cent in strength on standing twenty-four hours, and that similar liquors containing equal quantities of cupric oxide, powdered copper, ferric oxide and powdered iron showed the following losses: CuO, 79.2 per cent; Cu, 18.1 per cent; Fe_2O_3, 29.2 per cent, and Fe, 5.6 per cent. These figures lead to the deduction that at the point of the iron deposit the bleaching action was more intense and was responsible for the tendering action.

The proper loading of the kier should be given careful attention, so that the yarn is evenly distributed or packed to prevent channeling during the boiling and circulation period. The kier should not be overloaded, particularly with spiral-bound warps, otherwise uneven and unsatisfactory boils and bleaches will result. It will be found a very safe rule that if the load contains hot spots after the last cold wash the yarn has not been evenly boiled.

The kier should be equipped with pressure and temperature control charts to record the progress of the operation. This is particularly desirable, because the boiling operation is frequently conducted during the night, when there is little supervision to follow it. The charts the next morning show exactly what has transpired throughout the operation. The boiling operation should proceed with a regular and constant circulation under about 15 pounds pressure for a period of six to eight hours, after which the liquor should be run off and the yarn thoroughly washed with warm water and finally with cold. Cold water at first is not to be desired, as there are present in boil-off liquor

mucilaginous products which cold water may cause to separate as a gumming mass, which is rather difficult to redissolve.

It is a difficult matter to exactly prescribe the best procedure for conducting the mechanical details of operating a kier, as conditions such as steam, water pressure, the weights and form in which the yarn is packed will vary in different plants and can best be worked out in the individual case.

However, it is quite certain that a properly conducted boil with good water will almost always be rewarded with a good bleach, and it is equally true that a poor kier boil will result in a correspondingly poor bleach.

After the kier boiling operation we will now discuss the third of the operations—that of bleaching itself.

The bleaching agents employed for cotton are those which accomplish their purpose by oxidation, either direct or indirect, and consist of the hypochlorites, peroxide and permanganate. As for warp bleaching, the hypochlorites have found most favor, we will confine ourselves to an outline of the process involving their use.

The first hypochlorite used was bleaching powder, a mixture of calcium chloride and hypochlorite. This product always contained some calcium oxide and carbonate, and when digested with water its use was accompanied with a period of settling to remove the insoluble portion; and due to the uncleanliness of this operation, together with the fact that the chemical itself was not very stable or uniform, and also the appearance of liquid chlorine, that calcium hypochlorite is now almost universally replaced by the sodium salt, which can be prepared by the electrolysis of sodium chloride or by the combination of chlorine gas with soda ash, caustic soda, or both, the latter method being the one most commonly used.

Much discussion has arisen as to just how hypochlorites accomplish the bleaching action. However, it is generally conceded that it is the free hypochlorous acid, which exists or is hydrolized from the hypochlorite, that is the source of the active bleaching oxygen, by being reduced to HCl + O, and that this HCl then reacts with a further supply of the hypochlorite to liberate more free hypochlorous acid. It is further believed that the CO_2 from the air and also that produced by the oxidation of the organic coloring matter also assist in liberating free hypochlorous acid. This would mean that the bath after bleaching would become less alkaline due to free HCl being produced and the liberation and absorption of CO_2, and this will be found to be the case. It is also a fact that the less alkaline the bleach liquor the more active will be the bleaching action, so that the speed of the operation can be controlled by the alkalinity of the bath. A bleach liquor prepared from 200 pounds soda ash, 50 pounds caustic soda and 100 pounds liquid chlorine will produce a stock liquor which can be kept for over a week's period with but a slight deterioration, and which when diluted to proper strength will provide a very practical bleaching liquor.

After this brief theoretical consideration, let us proceed to the mechanical side of bleaching. I will avoid, for the sake of time, actual capacities and dimensions, as they would vary considerably with the individual plant production requirements, and only give them in a general way.

The preparation of the stock liquor or concentrated bleach is as follows: The caustic soda and soda ash are dissolved in a relatively small volume of hot water in a tank conveniently placed over the lead-lined stock tank so it can be emptied into the stock tank by gravity flow, and diluted to the proper volume with cold water so that the solution is not over 80 deg. Fahr. The chlorine is then passed into this tank through a lead pipe perforated with small openings to allow the gas which is formed on releasing pressure on the chlorine tank to pass slowly and combine with the alkalies. This lead pipe conveying the gas is run diagonally across the bottom of the stock liquor tank.

A more modern equipment is that of Wallace & Tiernan, in which a specially designed injector effects the combination of the alkali and chlorine from lines provided with pressure-indicating meters, the gas being supplied at the desired rate and pressure from an evaporator which is essentially a steam-heated water bath with thermostat control and pressure-regulating valve.

The amount of dilute bleach liquor required is about the same as in the kier-boiling operation—about ½ gallon of liquor per pound of yarn.

The bleach wells are satisfactorily constructed of concrete and cubical in shape; ordinary smooth cobble stones form a very efficient false bottom. The bleach is pumped from the dilute lead-lined liquor well and supplied to the bleach vat either through a wooden screen placed over the vat or through a brass pipe perforated with small openings for spraying the bleach over the yarn evenly. The vats are supplied with two drains, one back to the dilute well and the other to the sewer. Water lines used for washing should be provided with bleeders to clean pipe lines before using upon the yarn.

The souring wells can be constructed of wood, with one or two drains to the sewer and a wooden slat false bottom. They should be rectangular in shape to keep them as shallow as possible to facilitate rapid and effi-

cient washing. The washing is accomplished either through a wooden screen or by spraying through perforated pipes, as already described.

The yarn from the kier is either passed over reels directly into the bleach vat or into a gray sour to remove mineral matter precipitated from the water or in the yarn itself, also to neutralize any trace of alkali left from the boil-out. Following the gray sour, the yarn is thoroughly washed before being transferred to the bleach vat. A bleach liquor diluted to from 1.5 to 2 grams per liter available chlorine is the usual strength bath, and after the bleaching operation will be found to contain from 0.8 to 1.3 grams per liter, depending upon condition, and can be economically strengthened with concentrated bleach for the next batch.

The strength of the bath should be tested each day before and after strengthening the liquor from the previous bleach. I have found the $Na_2S_2O_3$ method, by the addition of an excess of KI and H_2SO_4 and titration of the liberated I, a very convenient and reliable one. In this connection it may be of interest to those who have found $Na_2S_2O_3$ to be rather unstable to quote the investigations of the Kilpatricks on the stability of this solution, the results of their experiments appearing in the September, 1923, edition of the Journal of American Chemical Society, and to the effect that when prepared from freshly boiled redistilled water, a solution having a factor of 0.01408 after eight months had dropped to but 0.01401. They concluded the deterioration to be caused by bacterial action.

In transferring the yarn to the bleach vat, care should be taken to prevent channeling, and should be covered completely with the bleach liquor, covered with burlap and allowed to stand half an hour, when the liquor is allowed to drain back to the dilute stock tank, which will require about twenty minutes, after which the liquor is pumped back onto the yarn for another half hour. The airing operation during the draining periods has the advantage of drawing air with its CO_2 through the yarn, the effect of which has already been mentioned. The bleaching is now completed and a thorough wash follows—usually about six separate portions suffice—and after a short drainage period is transferred to the white sour, which should be about one-half of 1 per cent H_2SO_4. The souring period should be about twenty minutes, after which follows a thorough wash. Before standardizing the number of washes, careful tests should be made for traces of free chlorine and acid.

The bleached, soured and thoroughly washed yarn is then drained and is ready for a thorough squeeze and delivery to the drying cans, or whatever drying process is found convenient. This squeezing can, if desired, be combined with a softening or tinting operation if the use to which the yarn is to be put demands it.

Don't Forget the Annual Meeting

of the

American Association of Textile Chemists and Colorists

to be held at the Providence-Biltmore Hotel

Saturday, December 8, 1923

A detailed program will be sent to all members by mail. Subjects of vital importance will be discussed at the technical sessions. Excellent speakers will follow the annual dinner Saturday evening. An informal smoker of a social nature will be held Friday evening preceding the meeting proper

ALL MEMBERS SHOULD MAKE EVERY EFFORT TO BE PRESENT

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

LOUIS A. OLNEY
PROFESSOR OF CHEMISTRY AND DYEING, LOWELL TEXTILE SCHOOL
Directing Editor

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THE DYESTUFF DEMONSTRATOR—HE IS AN ASSET!

IN our issue of October 22, under the caption "The Dyestuff Demonstrator—Is He an Asset?", we presented at some length views on both sides of this question summarized from conversations with various persons identified both with the manufacture and the application of dyestuffs. We concluded with an expression of the hope that those of our readers who had decided opinions upon either side of this discussion would communicate their views, with the idea of enabling us to give the industry the benefit of their collective opinion.

The response to this request has been considerably larger than we had anticipated, both in the form of written communications and in verbal opinions expressed to members of our organization. Particularly during the week of the Textile Exposition in Boston, where we were brought into daily contact with large numbers of dyers and textile chemists, were we able to get a first-hand impression as to how this matter is regarded by the industry as a whole.

It is apparent that the great majority, both of dyestuff manufacturers and consumers, regard the truly competent dyestuff application experts employed by dyestuff manufacturing concerns as a very valuable addition to the service rendered by these concerns to their customers.

Emphasis in all cases is laid upon the qualifications of the individual expert. It is generally admitted that there are a certain number of so-called demonstrators who have very little native ability or knowledge of their own but who depend upon information which they are able to pick up in their journeys from mill to mill, and who pass on this information to competitive concerns, to the real advantage of no one and the detriment of some. Fortunately, however, this class seems to be in a decided minority, and is far more than offset by the very real service rendered by exceptionally capable men employed by many dyestuff manufacturers.

As concrete expressions from individuals of reputation carry more weight than generalities, we take the liberty of publishing herewith extracts from various letters on the subject which have come to us.

Walter M. Scott, chief chemist, Cheney Brothers, writes in part as follows:

> I believe that the good dyestuff demonstrator is a distinct asset to the trade and that it would be a decided backward step if his services were discarded. You state that almost all the larger mills now employ competent chemists and colorists who have worked out their own practical methods of application. This is, of course, true, but I do not believe that any of these men are so good that they would not be helped by the advice and suggestions of other people working along the same line. Furthermore, one organization alone, no matter how large, cannot hope to adequately solve all the problems presented to it, and it stands to reason that the more men of the right type who are working to improve the processes of dyeing and printing, the better off the industry is as a whole.
>
> Another point which this editorial advances is that the application expert gets more from the mills than he gives to them. I think that this is entirely the fault of the mills themselves, and is a matter which can be remedied. Anyone who is familiar with the manufacture of dyestuffs knows that an essential feature of the organization is the semi-works, where the methods inaugurated in the laboratory can be tried out under regular plant conditions. A number of the up-to-date dyeing establishments have adopted this idea and have established a semi-works dyehouse where the new formulas and processes worked out in the laboratory can be given a practical trial on a larger scale. I believe that this practice will become more and more common as its advantages are realized. Thus the visiting expert can be given free rein in the laboratory and experimental dye room to work out his ideas, without bringing him in touch at all with the so-called secrets of the dyehouse which the editorial stresses so strongly.
>
> My preceding remarks apply entirely to the technically trained demonstrator with sufficient practical experience to be of real service to the dyer. Such a man should be capable of carrying out a line of research to a successful conclusion and thus make a distinct contribution to the science of dyeing. I hold no brief for the dyestuff manufacturers who, in the interests of economy, fill up their organizations with second-rate men whose only means of disseminating information is to ferret it out at one mill and then pass it on to others. It is my opinion that the manufacturers would be better off if they economized by cutting down the number of common salesmen who are only qualified to quote prices, a matter which could just as well be done by mail, and spend their money for a few good demonstrators who could be of real assistance to their customers.

Dr. Scott represents the type of highly trained application expert which might be expected to be self-sufficient, if any class could be so designated. In other words, if a man of Dr. Scott's training and experience admits the value to him of the co-operation of technical experts from the dyestuff houses, there can be little

question but that this co-operation should be of value to anyone in the industry.

William D. Livermore, chief chemist, American Woolen Company, differs from Dr. Scott in that he believes the larger and better equipped mills can dispense with the services of expert demonstrators. He believes, however, that the smaller mills not so fortunately situated, and which are, of course, in the large numerical majority, have much to gain from this service. A paragraph from his letter follows:

> I do not think that the application expert has much of a field in the larger mills that have their own chemists and first-class dyers. I do think that he still has a good deal of a field with the smaller mills that do not, as you say, possess technical talent of their own.

Elvin H. Killheffer, vice-president of the Newport Chemical Works, objects strongly to some of the remarks made in our previous editorial. His letter follows:

> I have read your editorial entitled "The Dyestuff Demonstrator—Is He An Asset?" I must say the general tenor of your editorial seemed to me personally to be entirely out of order and not in accordance with the facts. The instances that you cite where the so-called expert carried away information which his firm afterwards disseminated as its own are certainly not in line with experience that we have either had or heard about.
>
> If a man of the type described visits a mill, or any industry for that matter, as a technical expert, a salesman, or anything else, and then simply sees how much information he can get in order to carry it away somewhere else, then I would say that he has not a proper sense of the fairness of things and that expression would stand without regard to what his title might be. Certainly it would not be confined to the dyestuff demonstrator.
>
> There is no question in my mind that if the demonstrator is the proper sort of a person he certainly can do a great deal more good than harm as he circulates throughout the trade. We gladly send out demonstrators whenever the opportunity offers with the one idea in mind of helping in every possible way to overcome any difficulty which may arise, no matter from what cause. If the demonstrator is successful, then the person for whom the demonstration is made certainly is the gainer by the visit, and there is no question that the demonstrator himself gets a broadened vision and experience by these visits. He very naturally learns something everywhere he goes, all of which makes him of more value in his continued visits, without, as in the instances you have described, abusing any confidence that may have been reposed in him anywhere.
>
> There is another side to this question which is overlooked—I think it was overlooked by the writer of this particular editorial—that is, many times a shipment of dyestuff is sent to some mill to do some specific job. The mill later affirms that the dye would not do the job; that it has not the shade or fastness claimed. In other words, it is altogether bad and worthless. Now, it is usually true that the same color is being used elsewhere for exactly the same purpose and very satisfactorily. That being the case, the dyestuff manufacturer wants to send his demonstrator, and feels he should be allowed to do so. Very often we are met with the firm reply, "no demonstrators allowed in our mill," and it does not make any difference how unreasonable his claim may have been in reference to the goods. The customer does not let a demonstrator in to show how the goods can be successfully used.
>
> Assuming that his complaint was made in good faith, the customer certainly is decidedly the loser by not allowing the demonstrator to help him.
>
> Another consideration that might simply be mentioned is this. The man in the mill may be a veritable expert on the kind of work he is handling and yet may be stumped on some comparatively simple thing in the course of his work. A technical man coming in from the outside may very easily run on this thing almost immediately, not because of his greater knowledge or technical ability, but just because he looks at the thing from an entirely different perspective than the man who is on the job all the time. This perhaps is a daily occurrence throughout the industry, as I think most of us will agree.
>
> To sum the whole thing up, the dyestuff demonstrator, if he is of the proper caliber, is a valuable adjunct to the selling organization of the dyestuff house because and only because he is in position to be of considerable service to the industries that consume the dyestuff manufacturer's products.

Dr. Killheffer speaks from wide experience, and his point in regard to the refusal by mills to accept deliveries of dyestuffs because of their contention that they would not produce the results claimed for them, without giving the dyestuff house an opportunity to demonstrate how these results could be obtained, is certainly very well taken.

A. E. Hirst, assistant superintendent, American Printing Company, feels somewhat as does Mr. Livermore—that the demonstrator is not indispensable to the mill which possesses a large and well-trained staff of experts of its own—but he admits their value to other mills. In particular he cites the value of the trained application expert employed by the dyestuff manufacturer to all mills because of his ready appreciation of the technical defects in the manufacture of any particular dye. This appreciation enables him to place the matter intelligently before the manufacturing department and so correct the difficulty at the source. Mr. Hirst's letter follows:

> My experience has been that the dyestuff demonstrator is not indispensable to a plant with an efficient technical staff. He may be of value in giving information concerning certain peculiarities of his products, but such information could be dispensed by the salesman or by correspondence without actual demonstration.
>
> I think it is a fact that in general demonstrators learn more for their own use than they impart to their customers having a staff whose every-day duties train them in work of this nature and who are more conversant with conditions in their plant than is the demonstrator. I have in mind a representative of a German dyestuff house before the war who called at

our plant to demonstrate the use of a new color. He had voluminous information, printed and in writing, as to the details of conducting the dyeing, included in which were instructions for retarding the development of the color. Before he left he had been shown by the plant staff that the development was already exceptionally slow without the addition of a retarding agent. His arrangements for modifying the machine were very impractical, and in general the details were worked out by our own men for the good of other customers of the dyestuff concern, and at our expense.

I might say that as a rule methods explained by demonstrators have been simplified, sometimes very considerably, by our own orzanization. It may be said, however, that in certain cases practical representatives of dyestuff manufacturers are of value not actually as demonstrators, but as men to whom difficulties may be outlined for the purpose of eliminating some defect inherent in the manufacture of the color itself. Their training has usually fitted them to appreciate the dyers' difficulties and perhaps to suggest improvements in the production, and in this way their services can be used to advantage by the large consumers in question.

An executive of one of the larger dyestuff manufacturing companies who wishes his name withheld, but for whose long and wide experience in dyestuff application matters we can vouch, writes as follows:

> Large manufacturers are continuously putting on the market new colors, and the formulas which can be given in the circulars and in the literature cannot always be outlined in sufficient detail to guide the mill chemists and dyers in obtaining the best results.
>
> For instance:
>
> You would probably be surprised how many people dyeing Indigo, which is an old and well-known dyestuff, are continuously asking for technical advice to overcome difficulties which they encounter. We find the same condition in mills using Sulphur Blacks, due to the varying grades of goods and the varying types of machines.
>
> But, of course, the need of a technical demonstrator becomes imperative with such classes of colors as the Naphthanils and Vats where the slightest deviation from set principles and formulas completely ruins results.
>
> While technical demonstrators are liable to pick up some important information from the mills where they work, generally speaking, they give much more than they take, as, if they are good men, they know the field of application of a particular dyestuff in question much more thoroughly than the average dyer or chemist.
>
> You speak in your article of a possible abuse of confidence and voluntary, or involuntary, dissemination of secret information through the medium of a technical demonstrator. Obviously, this is a danger, but it comes down to the question of the man employed and in practically an equal degree to the policies of the employers.
>
> In conclusion I would say, that in my opinion technical demonstrators are an enormous asset; I would go further and say—an absolute necessity. But unless they are men with high principles and employed by firms with correspondingly high ethics, they may do more harm than good. I may state that the major part of the technical work done by our own demonstrators is at the particular request of the mill.

Alfred F. Lichtenstein, president of the Ciba Company, writes briefly but forcefully as follows:

> Any man, who absolutely commands his subject, is an asset to both the house he is working for and its customers. None of us, no matter how capable, covers the entire field, and the intimate knowledge that a man acquires of a certain line of dyestuffs is most helpful to the consumer.
>
> Sending around so-called experts, simply in order to get somebody into a mill, and having him nose about, would not come under the above heading.

H. Gardner McKerrow, sales manager, Althouse Chemical Company, feels that the function of the demonstrator as being of value to the mill should be limited to the explanation of the qualities and characteristics of new dyestuffs, and that the demonstrator who endeavors to instruct a dyer on practical matters is a menace to the consumers. A portion of his letter follows:

> A strong differentiation should be made between technical service offered for the explanation and demonstration of new dyes, and that service which assumes to instruct a dyer on the general principles of dyeing.
>
> There have been a number of instances around here of small dyeing plants being started by men who were not fitted to run them, and who depended almost entirely on practical information given them by dye-making concerns—actuated by a belief that they were thereby increasing the sale of their dyes—and which resulted in the establishment of competitive conditions which ruined the market for everyone.

In addition to the written expressions quoted above we have, as we mentioned at the beginning of this editorial, received verbal expressions from a very considerable number of mill men, particularly in the New England district. These expressions range all the way from qualified approval to very strong advocation of the application expert. Nearly every one emphasizes the importance of the demonstrator's knowledge and ability.

In short, we believe that the proposition may be summarized as follows:

If the demonstrator is thoroughly competent technically and if he is a man of high ethical standards he is a tremendous asset to the concern by which he is employed and to the mills which are its customers. If, however, he falls short of these qualifications he is likely to do much more harm than good to all parties concerned. It seems to us that Dr. Scott has hit the nail on the head when he recommends that dyestuff manufacturers should endeavor to employ men of the highest ability and integrity for the purpose of render-

ing technical assistance to their customers, and eliminate from their forces men whose limited qualifications are likely to react to the detriment of their employers and of the mills which they attempt to serve.

In the foregoing we have endeavored to reflect the feeling of all factors of the industry as we have found it. It is quite possible, however, that many divergent views may be held by persons well qualified to speak with authority. If such there be, we sincerely hope that they will contribute to the general good of the industry by permitting us to publish their views in the matter, to the end that a policy may be outlined for dyestuff distributors which shall be of the utmost service to them and to their customers.

OCTOBER DYE IMPORTS

(*Continued from page* 834)

Name of Dye and Manufacturer	Quantity (pounds)
*Supramine Red B—(By)	66
Wool Fast Blue	770
Wool Fast Blue BL—(By)	
Wool Fast Blue GL—(By)	

UNIDENTIFIED VAT DYES

Name of Dye and Manufacturer	Quantity (pounds)
†Algol Brilliant Pink FF Pst.—(By)	602
Algol Brown G Pst.—(By)	1,409
*Alizarine Indigo 5R Pst.—(By)	399
Ciba Pink (sgle. stngth)	2,769
Ciba Pink B Pst.—(I)	
*Ciba Pink BG Pst.—(I)	
*Ciba Pink BG Pdr.—(I)	
*Grelanone Yellow G Pst.—(GrE)	560
Helindone Pink R Extra Pst.—(M)	4,440
Hydron Brown (sgle. stngth.)	157
Hydron Brown G Pst.—(C)	
Hydron Brown R Pst.—(C)	
Hydron Orange FR Pst.—(C)	331
Hydron Pink (sgle. stngth.)	968
Hydron Pink FF Pst.—(C)	
Hydron Pink FF Pdr.—(C)	
Hydron Scarlet (sgle. stngth.)	1,210
*Hydron Scarlet 2B Pst.—(C)	
*Hydron Scarlet 2B Pdr.—(C)	
*Hydron Scarlet 3B Pst.—(C)	
Indan. Blue BC (sgle. stngth.)	12,265
Indan. Blue BCD Dbl. Pst.—(B)	
†Indan. Blue BCS Pdr.—(B)	....
Indan. Brown G (sgle. stngth.)	2,060
*Vat Brown G Pdr.—(By)	
Indan. Violet BN Pst.—(B)	1,964

UNIDENTIFIED MORDANT AND CHROME DYES

Name of Dye and Manufacturer	Quantity (pounds)
*Alizarine Fast Gray 2BL Pdr.—(By)	3,981
Brilliant Chrome Blue	220
*Brilliant Chrome Blue 2B—(DH)	
Brilliant Chrome Blue S—(DH)	
*Chromacetine Blue S—(DH)	220
Chromanol Black RVI—(DH)	55
Chrome Fast Phosphine R—(DH)	55
*Chrome Printing Red B—(DH)	220
*Chrome Violet C 3BD—(DH)	110
*Chromoxane Brilliant Blue G—(By)	440
†Eriochrome Flavine A Conc.—(G)	2,846
Metachrome Black AG—(A)	5
Metachrome Blue Black 2BX—(A)	1,000
Metachrome Olive 2G—(A)	1,000
Metachrome Violet	220
*Metachrome Violet B—(A)	
*Metachrome Violet 2R—(A)	
*Modern Olive IN—(DH)	55
Modern Heliotrope DH—(DH)	110
Ultra Brown R—(S)	55

UNIDENTIFIED DIRECT DYES

Name of Dye and Manufacturer	Quantity (pounds)
Benzo Fast Black—(Q)	2,203
*Benzo Fast Heliotrope 4BL—(By)	220
*Benzo Fast Orange 2RL Pdr.—(By)	300
Benzo Light Blue 4GL—(By)	220
Benzo Light Rubine BL—(By)	110
*Benzo Light Brown 3GL—(By)	200
*Benzo Rhoduline Red B 3B—(By)	904
Brilliant Sky Blue 8G Extra—(By)	330
Chlorantine Fast Brown 3GL—(I)	2,205
Chlorantine Fast Orange TRL—(I)	4,409
Diamine Brilliant Violet B—(C)	1,000
Diamine Catechine B—(C)	500
Diamine Fast Bordeaux 6BS—(C)	800
Diamine Fast Brown GB—(C)	500
*Diamine Fast Orange EG—(C)	137
Diamine Nitrazol Green GF—(C)	518
Diazamine Black N Extra—(Q)	1,817
*Diazo Brilliant Scarlet B Extra—(By)	11
Diazo Fast Blue	1,765
Diazo Fast Blue BR—(I)	
Diazo Fast Blue 4RW—(I)	
*Diazo Fast Blue 6GW—(I)	
*Diazo Indigo Blue 4GL—(By)	371
Diazol Pink NR—(P)	2,204
Fast Cotton Gray VL—(A)	5
Diazo Sky Blue 3G—(By)	501
Naphthogene Blue 2R—(A)	1,100
Rosanthrene Pink—(I)	661
Zambesi Black	1,500
Zambesi Black V—(A)	
†Zambesi Black D—(A)	

UNIDENTIFIED BASIC DYES

Name of Dye and Manufacturer	Quantity (pounds)
Brilliant Acridine Orange	330
Brilliant Acridine Orange A—(DH)	
Brilliant Acridine Orange 5R—(DH)	
*Janus Black I—(M)	50
†Philadelphia Yellow 2G—(A)	50

UNIDENTIFIED SULPHUR DYES

Name of Dye and Manufacturer	Quantity (pounds)
Pyrogene Brown DTB New—(I)	1,102
Pyrogene Violet Brown X—(I)	3,086

UNIDENTIFIED SPIRIT SOLUBLE OR COLOR LAKE DYES

Name of Dye and Manufacturer	Quantity (pounds)
Fast Scarlet G Pdr.—(GrE)	10
Fast Scarlet RC Pdr.—(GrE)	10

UNIDENTIFIED, UNCLASSIFIED DYES

Name of Dye and Manufacturer	Quantity (pounds)
Fast Yellow G Base—(GrE)	10

ADDENDA

The following data are classifications as to the competitive or non-competitive nature of the items which were not classified in the September statement, and apply only to the dyes or chemicals included in that report which were not classified:

†Phosphine 3R
†Erika B Extra
*Katanol
†Fast Red AV
*Hydron Olive GN Paste
*Hydron Scarlet 2B Paste
*Hydron Bordeaux B Double Paste
*Hydron Bordeaux R Double Paste
*Hydron Green B Paste
*Hydron Violet B Paste
*Hydron Scarlet 2B Paste
†Diamine Catechine G
†Diamine Fast Brown GB
*Diamine Fast Brown G
†Brilliant Milling Green B
*Diamine Scarlet 3B
*Trisulfon Brown 2G Conc. 5/10
*Alizarine Sky Blue B Powder
†Hydron Pink FF Paste
*Helindone Fast Scarlet C Paste
*Algol Brown R Paste
*Colorant Lake Carmine de Garance
*Thioindigo Red 3B Paste
*Ciba Bordeaux B Paste
†Erio Fast Cyanine S Conc. 672
*Brilliant Milling Blue B
†Diamine Catechine G
*New Methylene Blue N
*Algol Brilliant Orange FR Powder
*Viridine Lake 1028 H
*Bismarck Brown AV (Lake)
*Basic Yellow T
*Alizarine Rubinole R Conc. 40/100
*Helindone Red 3B Paste
*Indanthrene Golden Orange RRT Paste
*Helindone Orange R Powder
*Hydron Violet R Powder
*Anthraquinone Violet Powder
*Victoria Pure Blue BO Powder
*Ignamine Orange R Powder (Pyramine Orange R)
*Vat Brilliant Violet RRP Powder
*Pilatus Scarlet A
*Diphenyl Fast Brown GNC
*Jasmine High Conc. 729
*Indanthrene Bordeaux B Extra Paste Fine
*Black BR
*Fur Gray B
†Indanthrene Violet RR Extra Powder
*Chromorhodine BN
*Alizarine Rubinole GW Powder
*Alizarine Rubinole R 40/100
†Fur Blue Black A
†Paraphenylene Diamine
*Ethyl Violet
*Alizarine Blue S 100% Powder
*Acid Alizarine Gray G
*Erioglaucine AP (for color lake)
†Benzo Fast Yellow RL (for color lake)
*Diazo Indigo Blue 4GL Extra
*Acridine Scarlet J
*Alizarine Rubinole 3G Powder
*Hydron Scarlet 3B Paste
*Cyananthrol BGAOO Powder
*Acid Alizarine Gray G
*Anthraflavone GC Paste
*Indanthrene Golden Orange G Dbl. Pst.
*Hydron Scarlet 3B Paste
†Paramethyl Acetophenone
†Heliotropine Crystals
*Indol Garanti
*Musk Xylol
†Heliotropine CP
†Sodium Salicylate
*Tabloid Quinine Salicylate
*Tabloid Sodium Salicylate
*Tabloid Potassium Bicarbonate
†Hypoloid Caeffine Sodio Benzoate
*Musk Ambrette
*Musk Ketone
†Chinoline CP Synth.
*Phenanthren Purified
*Methyl Cinnamate
†Methyl Anthranilate
*Gentian Violet O 1 gm.
*Fuchsine O 1 gm. Basic
*Toison Blood Fluid
*Romanowsky Stain 0.015 gm.
*Alizarine Red S Powder
†Anthracene Chromate Brown EB
*Indanthrene Scarlet GS Powder
*Indanthrene Bordeaux B Powder
*Algol Brown G Powder
*Indanthrene Golden Orange G Paste
*Alizarine Blue S Powder
*Polar Yellow 5G Conc. 622
†Night Blue Greenish D 724
*Erio Fast Violet RMS Conc. 601
†Erio Fast Fuchsine BL Conc. 573
†Diphenyl Chlorine Yellow FF Supra
*Diphenyl Fast Bordeaux G Conc. 266
*Thio Indigo Scarlet 2G Paste
*Helindone Orange R 10% Paste
*Helindone Fast Scarlet R Paste
*Alizarine Red S Powder
*Alizarine Astrole B Powder
*Helindone Brown G Paste
*Algol Corinth R Powder
*Alizarine Astrol B
†Minaxo Black BBN
†Cotton Pink GN
*Acid Alizarine Gray G
†Monomethylparamidophenolsulfat
*Chromanol Blue NR Powder
*Indanthrene Bordeaux B Ex. Paste Fine
*Indanthrene Bordeaux B Extra Paste
*Diazo Brilliant Green 3G
*Black BR
*Fur Brown NZ
*Indanthrene Golden Orange RRT Paste
†Fur Blue Black

The Action of Chemicals in Wool Scouring

Early History of Wool Scouring—Removal of Grease—Emulsification—Action of Soap—Alkali—"Patented Products"

By A. W. DAVISON, Ph.D.

Professor of Physical Chemistry, Rensselaer Polytechnic Institute, Troy, N. Y.

THE present high state of development in the art of wool scouring is the result of steady progress extending over several centuries. In the early days, when man first commenced to manufacture crude textiles from the clippings of his flocks, he was content to wash the fleece in running brooks, thereby eliminating sand, dirt and suint. Certain herbs were soon discovered to aid materially in this cleansing action, but it was not until the discovery of soap that any real success was had in the removal of wool grease.

Crude machines for carrying out the washing with soap were next developed. At first, they piled the fleece on the ground, or on clean stone, poured soapy water over it, and then worked the mass by tramping with bare feet. Then they gradually found that they could perform the washing operations better if they carried them on in crude vats, which they soon supplied with drain boards, and with rakes and poles for the agitation. They next discovered that the washing and scouring process went along with greater ease and rapidity if they heated the bath a bit, and they accomplished this, when necessary, by throwing a few heated stones in the vat. All these devices were the forerunners of the modern scouring bowl, with its gentle mechanical raking fingers, its squeeze rolls and its properly proportioned liquor tank.

The process of wool scouring consists essentially of the removal of three classes of materials from the fleece: suint or dried perspiration; wool grease, really a wax in composition; and miscellaneous dirt, such as sand, clay, vegetable matter, tar, etc. Suint contains a fairly high percentage of potash in combination with organic acids, and being soluble in both cold and warm water, is easily removed from the fleece by simple washing. Wool grease, however, is a complex mixture, consisting largely of certain so-called higher solid alcohols, both in a free state and combined with the ordinary fatty acids (fats), and is not only insoluble in water, but is saponified by, or reacts chemically with, caustic alkalies with extreme difficulty. Fortunately, wool grease is emulsified readily by soap solutions. Miscellaneous dirt is held by the fleece in a number of ways; mechanically by the suint, and by the sticky wool grease. When the two latter are removed, the dirt is freed, and may be taken out by washing. The chief problem in wool scouring is therefore seen to be the removal of wool grease.

The process known as emulsification, mentioned above, consists essentially of the breaking up of otherwise insoluble substances into such small particles that they will remain suspended in water, or in any other suitable solvent. Kerosene, which is known to be insoluble in water, apparently dissolves in that liquid if the two are shaken together, after the soap has been added. The resulting mixture is not a true solution, but is a cloudy or milky preparation known as an emulsion. Soap is the emulsifying agent. The kerosene has been divided into many extremely minute droplets, each covered with a soap film, which in turn is surrounded by the suspending water. Linseed oil and water may be made to form an emulsion in the same manner. Soap owes its great value as a detergent or cleanser to this emulsifying property. Lampblack and water do not mix well. You may shake them together as much as you desire, and the lampblack will separate out on standing, or if you pour the mixture upon a filter, clear water will run through, leaving the lampblack behind. However, on adding a little soap to the lampblack and water before the shaking process, you will find that the black will not separate out, and that both will run through the filter giving a very blackish solution. The soap has emulsified the lampblack.

The property of emulsification is not held by soap alone. Gelatin, white of egg, agar, tannin, and many other so-called colloids possess it; but soap is recognized as possessing it to the greatest extent.

The action of soap in the scouring bowl is, therefore, not chemical but physical, and is entirely a cleansing action. In the removal of wool grease from the stock, the soap acts in three distinct ways: first, it makes possible the wetting of the grease by the scouring liquor, by lowering the surface tension between the liquor and the grease; second, it emulsifies the grease by breaking it up into very fine particles; third, it coats these particles with a film of soap, which prevents them form reuniting or coalescing into large lumps which would separate out in the bath, or in the stock. The third function of the soap is called stabilization of the emulsion.

Loss of activity in scouring baths containing soap is

brought about in three ways: soap is used up in coating the droplets of wool grease; some is absorbed and taken out of the bath with the stock; and finally, the accumulation of dirt and wool grease in the bath will be so foul that the soap does not have further opportunity to do its work. Successful soap solutions for scouring run all the way from three-tenths to 1 per cent by weight; with certain investigators claiming that four-tenths per cent by weight is the best concentration of soap to use for this purpose.

Free alkali in the scouring bowl acts very much along the same line as soap, except for the fact that there must first be produced soap by the action of the alkali upon the free fatty acids of the wool grease. The soap produced is formed directly in or on the wool grease, and is in excellent position to emulsify the wool grease quickly. Free alkali added to an ordinary soap scouring bath, materially aids the activity of the soap itself, by assisting in stabilizing the emulsion. Beyond a certain concentration, however, which is somewhere between 1 and 2 per cent by weight, free alkali is harmful, in that it no longer assists stabilization but actually causes re-precipitation of the grease emulsion, and it also tends to blister the stock and to impart a harsh feel to it.

The use of "patented products," gelatin, oatmeal and allied substances in the scouring bowls may be explained largely by the emulsifying or stabilizing properties of these substances. In scouring with hard water, lime or magnesia soaps will form, and inasmuch as these are insoluble, they will separate out in the form of clots and flakes in the bath, and on the stock. If gelatin be added to such baths, it will emulsify these clots and will prevent them from adhering to the stock.—The Hunter Bulletin.

ANOTHER DYE PATENT SUIT BEGUN

While the decision in the Government suit against the Chemical Foundation seems to have become indefinitely lost in a baffling maze of arguments and briefs pro and con, a spark from the conflict has generated another dye patent litigation. Strangely, in this case, "ex-German" patents from the same lot are involved—those sold by the Alien Property Custodian to the Chemical Foundation and thence through regular trade channels to countless dyestuff manufacturers in the United States.

The Grasselli Chemical Company of New York purchased certain of these patents at the time of the private sale, and are now compelled to instigate proceedings against the Commonwealth Color & Chemical Company of Brooklyn to protect their rights against a peculiarly effective form of infringement. From advice given out by Clark H. Hebner, attorney for the Grasselli Company, the plaintiff charges the Commonwealth Color & Chemical Company with importing from Germany and selling in this country colors covered by the patents alluded to, an act that is regarded as equal to manufacturing those same colors here without license or permission from the rightful owner of the patents. In fact, it was deemed by the counsel to the Grasselli Company, an even greater offense than if the infringement consisted simply in working the patents here.

It is not improper to assume that the Farbenfabriken, from whom these dyes were imported, were well aware that these particular colors were protected in this country by patents taken out here by the Germans themselves, and that consequently importation and sale here would probably result in contention. Those who maintain the opinion that German agents instigated the Chemical Foundation affair doubtless will in this case find much evidence that should cause them to break out anew.

The colors covered by the patents which are declared to have been infringed are: Algol Brilliant Violet BB Powder, Algol Red R Extra Powder, Benzo Fast Heliotrope 4BL, Diazo Fast Yellow 2G, Alizarine Uranol 2B Powder, Diazo Fast Green GF.

In this, as in the Chemical Foundation case, principles and property rather than damages are involved. As the patents alleged to be infringed are worth comparatively little, the plaintiff can hope for no considerable sum, but has entered into the litigation with the express purpose of protecting their rights to patents which, at great expense and often extensive research, they developed and perfected, only to discover that their work will go for naught if it is possible for domestic dye firms to import the identical products and distribute them here without fear of opposition. Clearly the case is in the nature of a warning to other dye and chemical companies, who, unwittingly or otherwise, may be guilty of similar infringement.

FRANKLIN PROCESS BUYS YARN MILL

The Franklin Process Company which operates job dyehouses at Providence, Philadelphia and Greenville, S. C., announces that it has purchased the Cohannet Mill of Fingerville, S. C., and that it will operate this mill through a subsidiary company to be known as Franklin Process Spinning Mill, Inc.

This is a distinctly new departure on the part of this company. Organized originally as a manufacturer of dyeing machines the firm installed a small dyehouse at Providence, primarily as a demonstration plant. The job dyeing business met with such immediate success and grew so rapidly that a much larger dyehouse at Providence soon became necessary, and later others were organized in Philadelphia and Greenville.

The company now will go a step further and not only dye yarns on order for mills which are not properly equipped to handle their own dyeing, but will first spin the yarns, then dye and deliver to the customers for weaving.

The Cohannet Mill at present employs about one hundred hands and spins 20/2 to 30/2 cotton yarns. Plans are in progress to improve the equipment of the mill and to increase its capacity as soon as conditions warrant. The product of the spinning mill will be sold exclusively through the parent organization.

Wherein the Textile and Paper Industries Are Related and Contrasted

By Martin S. Griffin

BOTH paper and cloth are very ancient. Some covering for the body has been necessary ever since the days of Adam and Eve. Some means for recording time and heroic deeds of warriors and kinds have been in evidence from the earliest times. The textile and paper industries coincided when the skins of animals were used for protection of the body, and parchment was prepared for records, if we may refer to them in this fashion. Not so, however, when we contemplate the object and purpose of the two. Protection and adornment are the objects sought for in textiles, a purely physical object, for no lasting purpose, nothing more.

Paper in its generic sense has been the coveted instrument for preserving the record of great events since the days of tradition. Dull ears, beclouded minds and treacherous memories contribute little to progress. Each generation must begin as the preceding one had begun. As civilization advanced, it became evident that something more permanent and accurate was necessary. Centuries passed in making progress from records in hieroglyphics upon rough stones, pyramids, obelisks, tablets, skins and papyrus, to writings upon paper.

Thus "paper" becomes the instrument for preserving those priceless spiritual values won and transmitted by advancing civilization. One needs only to reflect upon the service of the public library to-day to realize, in some measure, the immeasurable utility of paper and what it means to progress.

Cloth and paper are alike of greatest utility to the human race, the one adorning and protecting the body, the other clothing the mind with the riches of wisdom and experience of those who have labored in the past.

Like all notable achievements in advancing civilization, both paper and cloth had very crude and small beginnings. The raw materials were cleaned and prepared wholly by hand and with very crude utensils. Paper was made by dipping a screen into a tub of pulp and straining out the water, while cloth was spun and woven on primitive wheels and looms with foot and hand power. Hand-made paper and homespun fabrics, or their imitations are always in vogue as novelties. It was not till the last century that either the power looms or paper machines attained any prominence.

In some aspects of the subject, textiles antedate paper. Many imitations of cloth are done in paper. Sometimes rich and costly fabrics for interior decorations are copied for greater decorative utility in paper. None but the very rich could afford these tapestries, woven with great patience and skill by artists in their way, but modern paper making has been able to copy the effects of tapestries in paper so cheaply that even the poor man can afford tapestry papers for the walls of his home.

Linen finish on writing papers has been in vogue for many years. Paper as a substitute for cloth has come into general use for napkins, towels, etc. Cloth and paper are so intimately associated that it is quite proper for us to express these in chemical nomenclature. Cloth-paper equals paper-cloth, and we do have this reversible reaction in paper yarns and cloth woven from it. The German people were forced to wear paper clothing to an extent during the last stages of the War. The loom and the paper machine are very near neighbors.

Some kinds of cloth can be woven from any fibrous material capable of being worked into a yarn. Paper can be made of any vegetable fiber. Practicability has, however, limited the raw materials which can be used in these industries to a few sources. Cotton, flax or linen, wool and silk are almost exclusively the raw materials for textiles, while only vegetable sources of fiber are chosen for paper.

Until the last fifty years, the paper industry lived upon or was the residuary legatee of the textile industry. What could be more rational or economical than that the cast off clothing of the people should furnish the raw material for an independent industry? All of the qualities which make cellulose, exemplified in cotton and linen, valuable for textiles are equally valuable for paper. The processes of wear in the life history of clothing are an asset to the paper maker. The value of flax fiber when prepared for textiles is such that it can stand the expense of cleaning, but the rejected straw, unfit for this purpose, cannot profitably be utilized for the cheaper product of paper, because it is not sufficiently resistant to the drastic reduction processes of the paper maker. Rags, therefore, are in many ways more suitable for paper than new stock, at least they are more economical to process and make a quality of paper that cannot be matched with new material.

With the necessary demand for paper, other sources have been sought, and wood has made possible the present newspaper, and entered into the composition of all paper products, except the highest classes of writing paper.

The manufacture of textiles is almost wholly mechanical, though the finishing processes are largely chemical. Paper making is a combination of both in its several stages. Thus the beating of stock is both a mechanical and chemical process which affects the quality of the product. No stage in the textile processes is comparable with it. This is the most essential part of the whole process and is preliminary to the formation of the sheet, just as the carding and spinning is reflected in the quality of the cloth.

Cloth processes consist in carding or combing relatively long fibers into a sliver which can then be spun and drawn into yarn of different counts. There are two kinds of yarns, warp and filling. The function of the loom is to weave or interlace these yarns at right angles. All styles are built upon this basic formation.

In the paper mill, carding and spinning has its counterpart in the beating engine, wherein the beating "draws out" and hydrates the fibers into a pulpy mass which, in the sheet formation will mat and felt.

Cloth, a sort of latticework, composed of simple

fibers forming threads or yarns, has many limitations, whereas "paper" composed of a semi-gelatinous-plastic pulp has no such limitations. We may almost view the making of paper as a fluid process of making near cloth.

The modern automatic and jacquard looms, and high speed up-to-date paper machines, are wonderfully highly developed, and are among the most useful of all modern inventions.

NEW DU PONT PRODUCT

E. I. du Pont de Nemours & Co. announce placing on the market a new blue under the name of Pontamine Diazo Blue BR.

When diazotized and developed with Beta Naphthol, deep bright blue shades are obtained, of excellent fastness to light and washing. The product is particularly suitable for silk, being very fast on this material.

It resists acetic acid cross-dyeing, and may be discharged to a clear white with sulfoxylates. It also may be dyed without diazotizing, simply as a direct color.

GEIGY ISSUES NEW COLOR CARD

Geigy Company, Inc., have recently prepared for distribution to the trade a new color card showing dyeings of their series of Erio Acid Colors. This series possesses unexcelled fast-to-light qualities and has excellent equalizing properties so that very level dyeings result. The shades shown are very pure and brilliant.

The Spectroscope and Spectrophotometer, and Their Application to the Identification and Analysis of Dyes

Part III

Method of Making Spectrophotometer Readings—Adjusting of Machine—Solution Employed—Mode of Operation—Taking Readings—Absorption Curves—Shape of Curves

By H. WALES

Associate Chemist, Color Laboratory, Bureau of Chemistry

Method of Making Spectrophotometer Readings

BEFORE any determinations can be made with a spectrophotometer the apparatus must be placed in adjustment. Although the details of this will vary somewhat according to the type of machine used, certain features are common to all.

The positions of the D sodium lines should be recorded at frequent intervals to make certain that the spectroscope is recording the correct wave lengths. A suitable light source should be chosen and located properly. This light should be sufficiently brilliant to give good illumination in the violet region. The author has found that a 500-watt stereopticon Mazda will give very satisfactory results.

In order to obtain clear and distinct spectra the two beams entering the machine must be parallel. This is usually accomplished by means of a stereoscopic lens. The illuminant is located at the proper distance in front of this lens to give parallel beams and the spectrophotometer placed so that these two beams will be nearly centered on the two slits or orifices of the machine. The photometer should now be adjusted to read zero absorption. If the two fields are not of equal intensity when viewed through the eyepiece the spectrophotometer must be swung slightly until this condition is reached. This adjustment should be further checked by changing the photometer setting in order to make one field darker than the other and then returning to the point of equal illumination. If the correct reading is obtained on the photometer the light source is located properly. This adjustment must be checked at frequent intervals for all types of machines, as either the lamp box or the spectrophotometer is always in danger of being moved accidentally. With a little experience this photometer setting can be checked in a few seconds. In the case of the "color analyzer," where the spectrophotometer and the lamp box are fastened to a common base this adjustment is accomplished by means of screws which raise and lower the lamps and by changing the position of the openings in front of the lamp box.

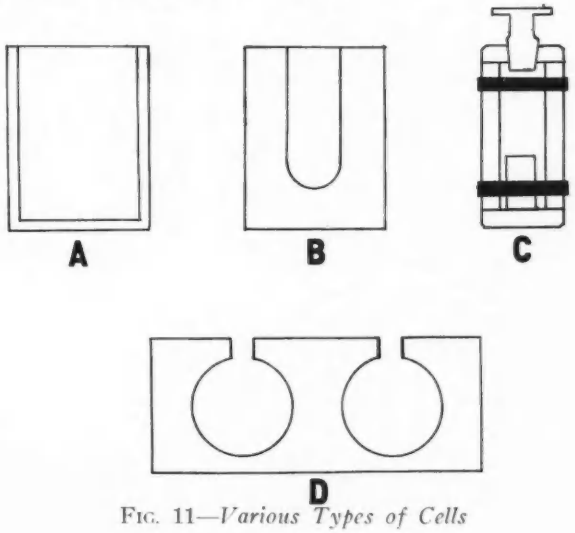

FIG. 11—*Various Types of Cells*

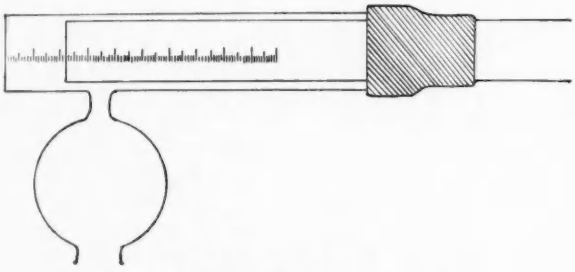

FIG. 12—*Baly Absorption Tube*

The machine is now ready for use, and a solution of sufficient concentration to give an easily readable absorption maximum should be prepared. While this will depend largely on the particular dye used, a concentration of 1 part in 50,000 (0.002 gram per 100 c.c. solvent) will be suitable for most of the azo dyes, and 1 part in 100,000 for the triphenyl methane and xanthene groups. A few dyes such as the quinolines must be used in even more dilute solutions.

For most work a cell of 1 cm. thickness is best. This eliminates the thickness factor, and the extinction coefficient E will depend only on the concentration. Several forms of cells used in absorption spectrum work are shown in Fig. 11. Single cells, such as (A) and (B), are often used. When employed with the Kruss apparatus, the liquid surface of the solution divides the beam. Due to the meniscus, however, the dividing line between the fields is not narrow and sharp, and some modification is necessary before these cells can be used for accurate work. A glass cube with optically plane sides is sometimes employed, in which case the top of the cube forms the dividing line. When volatile solutions are used, a stoppered cell is very convenient. Such a cell fitted with a glass cube is shown in (C). The cell (D) is the best type to use with instruments in which the two beams are side by side. One side of this cell is filled with the dye solution and the other side with the pure solvent. In this way any absorption due to the solvent will be balanced in both beams and will not appear in the results.

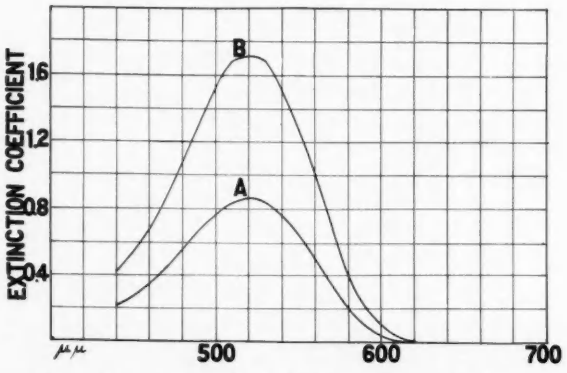

FIG. 13.—*Amaranth-Extinction Coefficients*

The cell should now be placed in the proper position in front of the spectrophotometer. The prism is then set for the particular wave length at which the absorption is to be measured, and the analyzing Nicol rotated until the two fields are of the same intensity. A good way to match the fields is to make first one and then the other field appear the brighter by turning the Nicol back and forth. When this is done rapidly a few times, stop in the middle of the swing and the fields will appear matched. The average of several readings made in this way should be taken. When the match is approached slowly less accurate results are usually obtained since the average eye is unable to distinguish between very slight differences in intensities.

In plotting an absorption curve the intervals at which readings should be taken is largely a matter of individual choice, and will depend to some extent on the slope of the curve and the point on the curve at which the observations are made. Sufficiently accurate results for most work can be obtained by determining the absorption at every 100 Angstrom units throughout the entire spectrum and at 50 units near the absorption maximum.

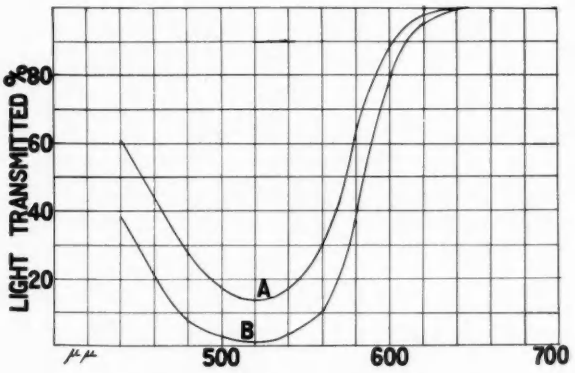

FIG. 14—*Amaranth-Transmission Percentages*

From readings taken at such intervals the point of maximum absorption can usually be estimated to within 25 Angstrom units. It is very doubtful in most cases if the eye is sensitive enough to determine variations in the absorption over a narrower range.

It has been mentioned that no two days show exactly the same absorption, and consequently any dye may be identified by determining the shape and position of its absorption curve and comparing it with known curves. Unfortunately no complete series of absorption curves, determined by photometric means has been published, so each investigator must make his own comparison curves from known dyes. The tables of Formanek may be used to give some suggestion as to the identity of the dye, but considerable discretion should be used in this matter as the absorption maximum as determined by the spectrophotometer may differ by as much as 50 or 100 Angstrom units from that determined by the simple spectroscope. This is more apt to be true in cases where the

absorption curve shows a very steep slope on one side and a gradual slope on the other.

Occasionally it may be necessary to use such extremely dilute solutions that the absorption of a one centimeter layer will be too faint to measure. In such a case the Baly tube (Fig. 12) will prove very serviceable. This consists of two tubes with plane ends, one tube being smaller than the other and sliding in it through a sleeve made of rubber tubing. By sliding the narrower tube in or out the thickness of the layer between the two plane ends is altered. A reservoir built on the larger tube takes care of the change in volume as the inner tube is pushed in or pulled out. A scale engraved on the outer tube enables the observer to obtain at once the desired thickness of layer.

In drawing the curves for absorption spectra several methods are used. That of plotting the edges of the bands for layers of different thickness of the solution has already been mentioned. Probably the most common method is to construct the curve with the wave length, or occasionally the frequency of light, as the abscissa and the extinction coefficient as the ordinate. Some investigators invert their curves by using the percentage of light transmitted as the ordinate. If any quantitative

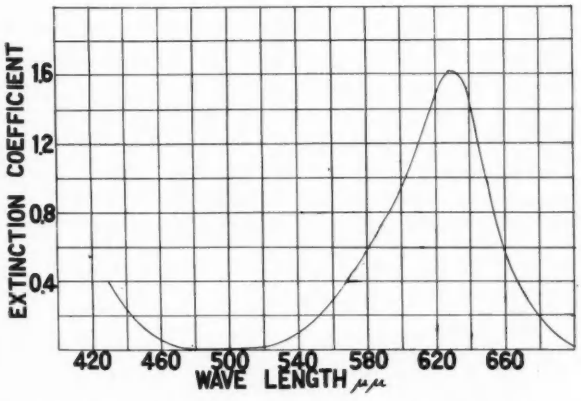

FIG. 15.—*Light Green S. F. Yellowish in Water*

spectrophotometric work is contemplated it is preferable to record the extinction coefficients, since E, which is the negative logarithm of the fraction of the light transmitted, varies directly with the concentration and the thickness of the layer. Doubling the concentration or doubling the thickness will double the value of E. The absorption curves for two Amaranth solutions, one having twice the concentration of the other, are plotted in Fig. 13 on the absorption basis and in Fig. 14 on the transmission basis, and clearly show the advantage of the former method for quantitative determinations. At the absorption maximum the ratio of the extinction coefficients for the two solutions is 0.86 to 1.72 or 1:2, the same as the ratio of the concentrations, while the corresponding ratio of the per cent light transmitted is 13.8 to 1.9.

No general rules can be given regarding the shape of

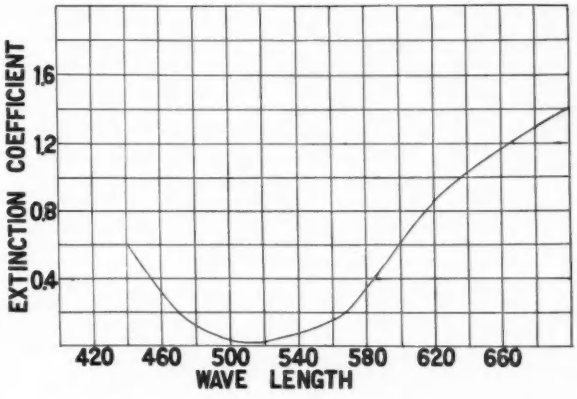

FIG. 16—*Naphthol Green in Water*

the absorption curves. Most of the dyes of the xanthene group show narrow, nearly symmetrical bands. On the other hand, many of the azo dyes give broad flat curves with very indistinct maxima. The point of maximum absorption for nearly all of the yellow and brown dyes is in the ultraviolet. Since this is beyond the range of vision only one side of the curve can be obtained and this is not sufficient to identify the dye. Green dyes show two bands (Fig. 15), one having a maximum in the red and the other band just beginning to appear at the violet end of the spectrum. One green dye, Naphthol Green (Fig. 16), can be easily distinguished by its curve inasmuch as both maxima are beyond the limits of vision, one at the red and the other at the violet end of the spectrum.

A large number of dyes show one or more secondary maxima. These may be distinct as in Fig. 17 or may appear merely as a flattening of the curve. They usually have a shorter wave length than the strongest band, but a number of cases are known where the positions are reversed. It should be noted at this point that these secondary bands may be caused by other dyes which may have been formed in the process of manufacture or added for the purpose of shading.

(Part IV will follow in a future issue)

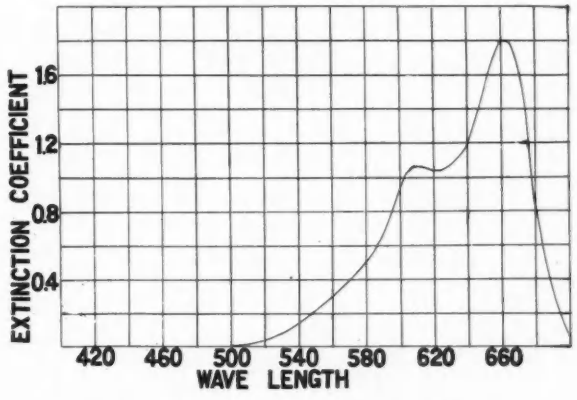

FIG. 17.—*Methylene Blue in Water*

RED C PASTE ANNOUNCED BY DU PONT

Lithosol Red C Paste is announced by E. I. du Pont de Nemours & Co., Inc. This product is one of the brightest known colors for the production of lakes, and for this reason it is used widely in the preparation of printing and lithographic inks, both in the form of the dyestuff and as the barium lake. As a pigment it is quite insoluble, and is used wherever a very bright red shade of orange is desired. When concentrated it has a decided bronze, and is therefore used as a bronze orange. The barium lake has a bluish undertone. This product wi'l surely answer a demand which has prevailed for this type of product.

A campaign to enlarge the number of both resident and non-resident members of the Chemists' Club, New York City, is under way. Every member is urged in a letter from F. M. Turner, Jr., chairman of the propaganda committee, to secure at least one new member before the close of the year. The clubhouse at 52 East Forty-first Street has been recently redecorated and refurnished, and is now splendidly equipped to take care the increased membership desired. Officers of the organization are looking forward confidently to the time when it will be possible for the club to accomplish many things that the increased membership will make possible.

The C. J. Tagliabue Manufacturing Company has issued two new brochures covering hydrometers, chemical thermometers and recording thermometers. These are profusely illustrated with colored pictures and diagrams of the instruments, and may be obtained free by writing direct to the Tagliabue company for Catalogues 417 and 905-A. One feature of particular merit is the reproduction of sections of the charts used in connection with the instruments. These give a clear idea of the operation and construction of each thermometer.

TO STUDY KNIT GOODS BLEACHING PROCESSES

An investigation and study of bleaching and water softening systems in order to determine the most effective and cheapest method of preparing knitted fabrics for the use of the consuming public is being conducted by the Associated Knit Underwear Manufacturers of America, it is announced by Roy A. Cheney, of Utica, secretary of the organization.

Members of the organization are being asked to supply all possible information regarding the systems they have in use in their plants, and the information thus received will be summarized and distributed to all members who have co-operated in the investigation.

It is explained that bleaching is one of the most important steps in the production of knitted underwear, and improper bleaching methods may not only increase the cost of operation unnecessarily but may, particularly if the water-softening system is not perfect, cause serious loss through damage to the fabric.

Dyes which it is claimed will produce the much wanted khaki color for military uniforms, which will remain fast even in the tropics, have been submitted to the chemists' committee co-operating with the United States Governmen, by the Amoskeag Company, Manchester, N. H. It will be recalled that the American Chemical Society was called upon by the army and marine officials after the latter had practically concluded that the only practicable solution of the problem of getting a domestic dye for uniforms would be to abandon the khaki color. The Amoskeag Company's chemists say that they are satisfied that the new dye will meet all field requirements. The company's dyeing staff will apply the new color to samples of uniform cloth which will be put to actual service tests.

Notes on the Dyeing of Direct Blacks on Cotton Piece Goods

Part XI

The Drying of Fabrics—Working of the Plant—Printing Operations—Printing and Drying Plant—Working of the Plant—Steaming and Following Operations—Simplification of the Plant

By RAFFAELE SANSONE

THE ADVANTAGES OF THE PLANT

There are several advantages in using the plant described in the preceding instalment. A few of them are considered below:

1. All four vats (D, C, B, A) can be employed for dyeing the same color in the same strength, or in two, three or four strengths, or for dyeing with two, three or four colors, etc.

2. If needed, one or two of the vats can be employed for rinsing operations.

3. Through a special arrangement, the material run through in one direction, can be made to repass on the

road made, changing its direction until the desired intensity of shade has been produced. In this way the machine does the work of four or more jiggers, using the same short baths.

4. In some cases the machine can be employed for multiple padding operations, using also baths containing thickening materials, the pressing rollers eliminating all excess of bath as on any ordinary padding machines.

5. The baths can be exhausted with salt, if required, or can be employed without salt, as on continuous dyeing machines.

The Drying of the Fabrics

The drying of the dyed cotton fabrics is accomplished with the above styles either on drying cylinders, a plate or chest drying machine, or on the tentering frame. This last apparatus is preferred in some works as it yields the fabrics in smooth spread form just as is desired for obtaining the neatest and most perfect printed effects.

The principle of a tentering frame often employed for the above purpose is shown in *Figure* 3.

This shows a high iron construction or case, composed of a long, broad rectangle, in which a very long pair of endless chains (E), entering on one side of the machine, are made to run through continually, so that each portion passes three times forward and backward on six horizontal planes, being guided by special guards that can be approached or distanced, in accordance with the width of the cloth to be dried.

Such chains are approached mostly at the beginning of inclined guards placed on the side of their entrance in the rectangular case, and here take up the cotton cloth (F) to be dried. This passes on to a wooden frame, where the operatives sit on a kind of bench. On running forward between the endless chains, the cotton material is carried into the drying case under a certain tension. Here it comes in contact with hot air circulated through the chamber by the assistance of the tubes (Q) and (X).

As it may be necessary to examine from time to time the goods for proofing, to see if the stretching applied is so strong that it breaks or splits the borders, or if it is insufficient for smoothing their surface for the purposes of the works, the iron chamber or case is supplied with special doors (D, D...). The cloth makes its exit from the plant on a special folding disposition (P) forming pieces. The whole mechanism of the plant is driven by a single electric motor (M) placed at one side of the large iron case.

The Working of the Plant

The work required to operate the above plant is not at all heavy for the work people, and if the parts are kept in perfect working order, little or no trouble will result. The process is explained in the following paragraphs: First, the wet dried fabric (F) is entered on the wooden frame (W); care must be taken that it is smoothed and opened out at once on the stretching bars of the frame, and, after passing below the platform, where the operative is stationed, it is guided by hand between the clips of the double chains, to be clutched at the beginning and dragged during a gradual stretching slightly above the original width, into the large iron case, where it is dried in a stretched condition by the hot air emitted from all directions. Fabrics having a smooth straight form are thus obtained, on which the designs can later be applied in a straight position during the passage on the printing machine. This considerably lessens the work of the operative.

The Printing Operations

The printing operations comprise, with the above styles, the preparation of the discharge pastes, and the treatment of the dyed cotton cloth goods with those on the printing machine itself. The preparation of the color pastes is conducted in some works in large wooden or enameled iron tubs, where all agitation operations are accomplished through the use of wooden sticks, and the heating is done by the use of open or closed steam coils, the preparer making allowance in the first instance in his recipes for the entrance of a certain quantity of condensed water.

In other works improved paste preparing plants have been adopted consisting of a series of double cased copper pans, generally of several sizes, that can be lifted and transported wherever most convenient, or are fixed to a solid iron frame; their contents being either emptied out through taps on the bottom, or by turning on

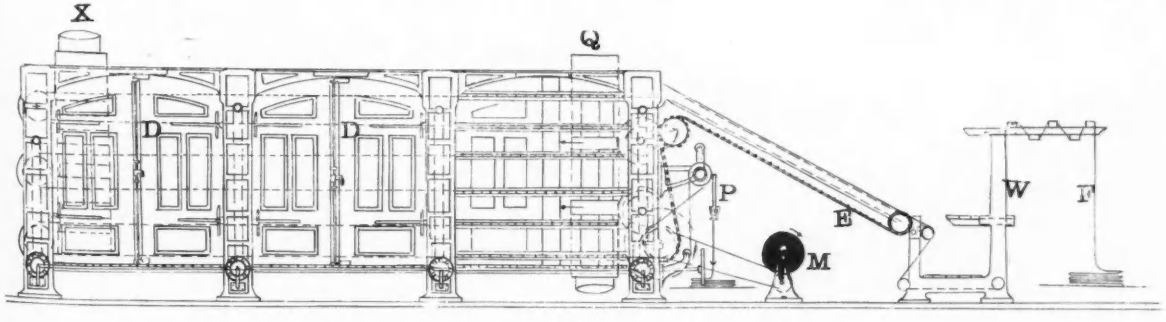

Fig. 3

short iron shafts placed on each side so as to pour out all contents into buckets or laddles placed just below.

There is no doubt, however, that the future will see a marked further improvement in this direction, tending to simplify the work of the operatives and to economize as much as possible in the production.

The Printing and Drying Plant

The printing and drying plant employed for discharging cotton fabrics dyed with direct coloring matters varies from works to works. It is divided in two portions, the first consisting of a one, two, three or more color printing machine, and the other of a hot flue, a tentering frame, or a cylinder drying machine.

When the patterns printed are not excessively heavy a plant constructed on the principle shown in *Figure* 4 gives excellent results, if employed with the necessary precautions, and under the best conditions for obtaining satisfactory results.

This plant contains a six-color printing machine (P) of light construction, supplied with the usual engraved copper rollers, color boxes, color applying brushes, doctors and central pressure drums. In this the material to be treated is entered from wooden shafts fitted on an upper projecting arm at the back of the machine.

The printing machine (P) is placed at the bottom of a high, light, iron frame serving for the distribution of the cloth being printed (C); for the distribution of the backcloth (B); for the distribution of the blanket; for the sustainance of a drying chamber (F) for the blanket that is very long in this instance; for the sustainance of five gun metal cylinders (D) for drying continually the backcloth (B), as this comes from the printing machine and is separated from the printed cotton fabrics (C); and eight other drying cylinders (E) for the drying of the printed fabrics.

On the front of the plant a plaiting arrangement distributes the cotton back cloth in the form of pieces ready for repeated use in the printing operations without requiring an intermediate washing. At the back of the plant is another similar folding disposition that distributes the dried printed fabric (C) in the form of pieces.

The Working of the Plant

The working of the above plant requires some experience, and cannot be learned after only a few hours observation, as through its use unsatisfactory printing or smudged effects are liable to result, especially if the printing operations are conducted at too high a speed.

The working of the plant is as follows: The blanket is entered on the printing machine (P) joining its ends, after it has passed through the drying compartment (F). When this has been done the dry backcloth (B) is run in just above the latter, carrying its beginning to the upper portion of the frame (G), and from here down over the five drying cylinders (D), it leaves these and descends a few inches below the moving arm of the plaiting disposition (X). The cylinders then initiate the entrance of the cloth to be printed, generally pinning or sewing the latter to the backcloth; and enter the printing colors in the six troughs of the printing machine, putting the plant in motion.

In this way the colored cotton cloth goods are printed with the different discharging pastes, being then carried upwards on frame (G). When, however, a certain point unpinned or unsewn and is rapidly sewn to the end of on the frame has been reached, the printed fabric is a piece that has been entered on the eight drying cylinders (E). Here the colored material comes with its uncolored portion against the uppermost drying cylinder, that results in a sufficient drying to prevent the smudging of the pattern when this comes in contact with the heated surface of the second and following warming cylinders treating it.

Some printers avoid the necessity of unsewing and sewing on the upper portion of the frame (G) by sewing the printed cloth, before its entrance on the printing machine, to a piece that is made to run from this through the cylinders (E) and the plaiting disposition following the same.

In this way only the end of the piece used in this

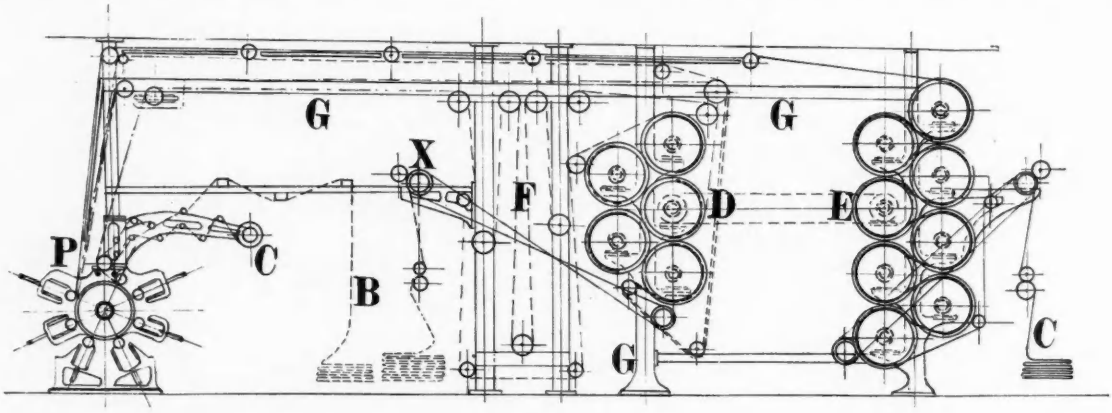

Fig. 4

instance need be touched by the printing colors and only one sewing is necessary. This and the following drying of the whole piece presents little opportunity for damaging the material. While the printed piece of cotton cloth is passing through the plant, the backcloth protecting the blanket just below, passes onto the five drying cylinders (D), being delivered to the plaiter (X) in a sufficiently dry state for being used again for the printing operations.

The Steaming and Following Operations

The steaming operations are conducted in this case in agers of the most varying construction. Some are constituted simply of large brick chambers lined with wood, where the material is hung in long folds down their whole height from a double ceiling, and steam is introduced from a generating boiler placed near by, regulating its entrance through a dry and wet thermometer placed behind a small window. A similar arrangement permits the production of the clearest colored effects and best whites, but because of certain difficulties has been abandoned in the best mounted works.

Some printers have adopted a continuous ager, where the material is run in contact with steam brought to a temperature between 102 and 105 deg. Cent. through the most convenient means in a rectangular iron case that is kept in as closed a condition as possible. The plant occupies in this case much less space than the former, and requires less time and labor, while being more regular in its treatment of the printed cotton material.

The drying that follows the above steaming, or an eventual chalking, is conducted also on plants of different construction, in accordance with the scale of production of the works, the plant at disposal and other reasons, using for the purpose a cylinder drying machine, a chain drying machine, or a plate drying apparatus. All such means give excellent results when worked under suitable conditions. The finishing operations are generally accomplished through the usual calenders, and in the cold or in the warm, in accordance with the nature of the luster or mat effects required.

Simplification of the Plant

The above plant could be much simplified, as shown in *Figure 5*, with the view of combining the different operations of treatment, rendering those also cheaper and easier for the foremen and operatives.

This figure shows an installation of very peculiar construction, containing a new form of dyeing plant (D), a printed cloth and backcloth drying arrangement (E and F), a steaming chamber (G), a final drying plant (H), an ordinary six or more color printing machine (P), a chalking range (C), and an ordinary finishing calender (K).

The dyeing plant (D) has on its lowest portion a four compartment dyeing vat (a, b, c, d), above which mounts to a certain height a hot air drying chamber. Compartment (E, F) contains on one side (E) guiding rollers, so disposed that the back of the material comes in contact with the same until its printed front has been nearly completely dried.

The material makes its way out, after turning several times round the rollers until then used, rising into a narrow upper delivery canal (J), and descends soon after into the steaming compartment of the plant (G). The second portion of (E, F), indicated in this instance by (F), collects the backcloth coming from the printing machine (P) just below, and causes it to run up and down several times on a double series of parallel and horizontal guiding rollers, dropping it after this to a rolling frame.

The steaming compartment is composed principally of a large iron chamber, having on its floor a superheated steam producer, a discharge arrangement for all condensed water formed, an air inlet regulated through a valve opening and closing on the outside, etc.

This chamber contains also a double series of horizontal guiding rollers, where the material to be steamed descends, and is taken up by one of the lower guiding rollers, being then delivered to the chalking plant (C). On its upper portion is placed a ventilator, that slowly aspires upward the superheated steam, drawing this off gradually with any vapors developed from the printed

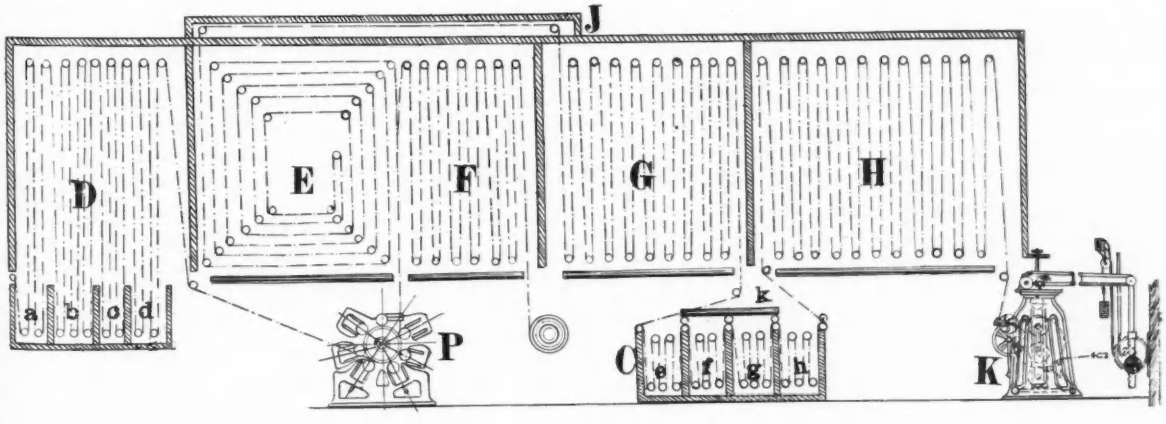

Fig. 5

material, for permitting a more energetic corrosion of the direct colors in the ground.

The chalking vat (C) has four separate compartments, the two first of which serve exclusively for the treatment with a weak chalk bath, and the other two for a rinsing with running water. The central compartments (f and g) are supplied with a special cover (k), allowing the maintenance of a certain heat in the baths contained therein, when the chalking bath is substituted by a hot water bath, or by a soaping bath. For this purpose the vat is also furnished with a closed steam heating coil. Each compartment has a certain number of lower and upper guiding rollers, and is followed by a pair of squeezing cylinders. The cloth mounting from the last of the same enters in the bottom of the final drying compartment (H).

This compartment is of proper length for drying the material sufficiently, and later allowing the production of the required finish on the calender (K) that follows. It is also supplied with upper and lower guiding rollers, and is heated by condensed water and waste steam coming from the other portions of the installation. The calender (K) offers no special characteristics, and can be any ordinary machine producing the desired finish.

The Working of the Plant

The work of the operatives on the above plant requires some study, as every phase of the process must be specially regulated. There is prepared, in a special vat supplied with a mechanical agitator and distribution tap, a strong solution of the dye bath that is to produce the desired effects on the goods to be printed; in a second vat, also supplied with a mechanical agitator, run in a regulated quantity of this solution, that is mixed with a fixed volume of water, causing the mixture to run slowly through the four compartments (a, b, c, d) of the dye vat, already indicated. Steam is then introduced in the radiators warming the interior of the oven just above, in the double chamber (E, F), in the final drying chamber (H), and in the steaming compartment (G).

When the different operations have been conducted, the entrance of the cloth to be treated is initiated. This is thus gradually colored to the desired shade, and is delivered to machine (P), where the printing pastes that are to serve for the white or colored discharges have been introduced. Here the dyed cotton fabric is covered with the necessary designs, and makes its way upward to be dried and separated from the backcloth.

A strong steaming then follows the drying that causes the different discharges to react on the coloring matters of the ground, producing the final effects that are completed later during the chalking or light soaping operations conducted in vat (C). From here the wet material mounts upward into the next drying chamber (H), that leaves in it from eight to fifteen per cent of moisture, and descends to be calendered on (K), folded in piece form ready for packing and delivering to the client.

The Advantages of the Plant

The advantages of the plant are several, and some of them can be considered as follows:

1. The dyeing operations are conducted with weak coloring matter solutions, that may also be the old baths of other dyeing operations.

2. The dyeing and drying operations are combined in one, using for the second the same steam that is necessary in the usual plants for the warm dyeing operations.

3. All dyeing operations are conducted in the cold, and for them many of the direct coloring matters used for warm dyeing operations can be employed.

4. The whole plant can be placed on the same landing, especially if the ceiling or roof of the chamber of treatment is of a certain height, the upper portion of the plant being suspended on heavy wooden or armed cement pillars.

5. All operations of dyeing, drying, steaming, printing, chalking and finishing are conducted in one run, resulting in a considerable saving of labor, motive power, steam, space, time and raw materials.

6. The use of superheated steam permits the discharging of some of the direct blacks and colors that have so far resisted this operation, and the production in other cases of full whites.

7. The cotton cloth goods, during their treatment, are continually under the eyes of the operatives, who can observe in time any imperfections or defects in any of the different phases of the treatment.

(The End)

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